A REVISION OF THE NORTH AMERICAN VERNONIEAE

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HENRY ALLAN GLEASON

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN THE FACULTY OF PURE SCIENCE OF COLUMBIA UNIVERSITY

NEW YORK

4 JUNE, 1906

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Dissertation

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A Revision of the North American Vernonieae

By Henry Allan Gleason

Several years ago it became apparent that certain species of *Vernonia* abundant in the western states had been so confused in various publications that satisfactory identification of them was almost impossible. Extensive field-work and detailed study of these doubtful species was alone insufficient to solve all the difficulties connected with them, so the investigation was extended first to include all the species of the United States and finally all the North American species of the tribe Vernonieae to which the genus *Vernonia* belongs. As far as possible the geographic-morphological method of Wettstein has been used, with results that it is hoped will prove of some value. The work has been done for the most part in the herbarium of the New York Botanical Garden, and it is a pleasure to acknowledge the valuable aid and criticism given by Professor N. L. Britton, Professor L. M. Underwood and Dr. P. A. Rydberg. Herbarium facilities, assistance and suggestion have also been given by Mr. C. C. Adams, of the University of Michigan, Mr. Stewardson Brown, of the Academy of Natural Sciences of Philadelphia, Dr. B. L. Robinson and Mr. M. L. Fernald, of the Gray Herbarium, Mr. William R. Maxon, of the United States National Herbarium, and Director William Trelease, of the Missouri Botanical Garden.

The Vernonieae as a group are characterized by homogamous discoid heads, anthers sagittate at base, styles subulate, leaves alternate and corollas not yellow. The shape of the style-branches is of particular importance, especially in distinguishing certain members of the group from alternate-leaved Eupatorieae. The branches are approximately semi-cylindrical in section and taper regularly from the point of division to the apex. The stigmatic surface is on the inner flattened side; the outer side is covered with hairs. The genera *Rolandra* and *Spiracantha* are anomalous in having the style-branches much shorter than is usual, but the hairiness of the outer surface extends much below the point of division, indicating a possible fusion of originally separate branches. The white, red, pink, or purple corollas are usually regularly five-cleft. In *Elephantopus* the corolla is more deeply cleft on the inner side.

In *Stokesia* the lobing of the corolla is deep, and the limb is flattened out to resemble a ray. *Piptocarpha* alone has anthers briefly caudate at base. Opposite leaves are reported for a few species, and in *Lachnorhiza* the leaves are all basal. The majority of the species are perennial herbs; others are shrubs, woody vines, or even small trees.

Bentham and Hooker recognized 40 genera and about 530 species. Hoffmann, in Engler and Prantl's Natürlichen Pflanzenfamilien, described 46 genera and estimated the number of species at 638. Including the additional genera recognized in this paper with Hoffmann's, the total would reach 51. The greater portion of the species, 380 according to Bentham and Hooker, 450 according to Hoffmann, belong to the type genus *Vernonia*. Probably 600 would be a safe estimate of the number of species in *Vernonia* alone.

The tribe is most abundantly represented in the Western Hemisphere, particularly in South America, where the abundance of individuals and variety of species is remarkable. They extend south to Argentina and north into the United States. In the Eastern Hemisphere numerous species are found in Africa and the warmer parts of Asia, and a few occur in Australia. None is found in Europe. Accepting Hoffmann's classification for the genera not occurring in North America, the distribution is shown in the following list. The figures in parentheses denote the approximate number of species.

Endemic to Africa: *Apodocephala* (2), *Bothriocline* (3), *Centauropsis* (3), *Corymbium* (7), *Erlangea* (2), *Gutenbergia* (7), *Herderia* (2), *Hoehnelia* (1), *Hoplophyllum* (2), *Msuata* (1), *Thysanurus* (1), *Volkensia* (1).

Endemic to Asia: *Adenoon* (1), *Lamprachaenium* (1).

Endemic to Australia: *Pleurocarpaea* (1).

Asia and Africa: *Ethulia* (1).

Endemic to South America: *Albertinia* (1), *Blanchetia* (1), *Chronopappus* (1), *Eremanthus* (18), *Gorceixia* (1), *Haplostephium* (2), *Heterocoma* (1), *Lychnophora* (17), *Lychnophoriopsis* (1), *Oiospermum* (1), *Piptolepis* (8), *Pithecoseris* (1), *Proteopsis* (2), *Sipolisia* (1), *Soaresia* (1), *Stilpnopappus* (15), *Telmatophila* (1), *Vanillosmopsis* (7).

Endemic to tropical America: *Oliganthes* (8), *Orthopappus*

(1), *Pacourina* (1), *Piptocarpha* (30), *Pseudelephantopus* (2), *Rolandra* (1), *Spiracantha* (1), *Struchium* (1).

Endemic to West Indies: *Piptocoma* (1).

Endemic to Mexico: *Bolanosa* (1), *Eremosis* (15), *Leiboldia* (3).

Endemic to the United States: *Stokesia* (1).

Both hemispheres: *Centratherum* (12), *Elephantopus* (14), *Lachnorhiza* (2), *Vernonia* (± 600).

It seems very probable that the Asiatic species included under *Centratherum* are not strictly congeneric with the American forms, and that the African plant referred to *Lachnorhiza* is rather to be placed in *Vernonia*.

The distribution of genera shows at once the two centers of distribution, one in Africa, the other in South America. Further details on geographical distribution will be given under the different genera.

The nomenclatorial history of the tribe begins with the first edition of Linnaeus' Species Plantarum in 1753, in which several species are described under various generic names. During the subsequent seventy years more than a hundred species were described and the principal genera were separated. Nevertheless the first consistent attempt at a logical classification is that of Lessing * in 1829. His first division, based on the presence or absence of so-called bracteoles, is no longer followed, but his subsequent divisions follow more or less closely the characters used by Bentham and Hooker and by Hoffmann. Lessing distinguished 28 genera, some of which are not properly included under the Vernonieae, and was also the first to bring together under *Vernonia* the various species described previously under *Serratula*, *Conyza*, *Achyrocoma* and *Lepidaploa*. Lessing continued his publications in Linnaea and in volume 6 gave a second conspectus of the tribe, recognizing the subtribes Vernonieae, Elephantopeae, Trichospireae, Rolandreae, Liabeae and Pectideae. His descriptions of species are full and his citations of synonymy usually very accurate.

Lessing's work was followed by that of De Candolle, who in 1836 monographed the tribe in volume 5 of the Prodromus. His Tribus Vernoniaceae was characterized by the subulate styles, and

* De Synanthereis Herbarii Regii Berolinensis. Linnaea 4: 240–356.

under it the subtribe Vernonieae was separated by its homogamous discoid heads from the subtribe Pectideae with radiate heads. Under the former he distinguished the divisions or subdivisions Ethulieae and Heterocomeae, corresponding closely to Hoffmann's Vernonieae-Vernoninae, Albertinieae, including *Lychnophora* and the related genera, Elephantopeae, Rolandreae, and Bojerieae. Of the latter but one genus is at present retained in the tribe. De Candolle's treatment was the first and only monograph of the group as a whole.

Passing over a number of articles on single genera or groups of genera, the next extended classification is that of Bentham and Hooker.* They recognized two subtribes, Euvernonieae, with separate heads, and Lychnophoreae, with few-flowered heads aggregated in head-like glomerules. That this division is natural is shown by their geographical distribution, the latter subtribe being entirely American, with the exception of one species of *Elephantopus*. Further division of the Euvernonieae separates the series Sparganophoreae with 3 genera, having the achene surmounted by a cartilaginous ring; series Ethulieae, with 11 genera, in which the pappus is caducous or none; series Euvernonieae, with 6 genera, having a pappus of persistent bristles; and series Stilpnopappeae, comprising 9 genera with scaly pappus. The distinction between the last two series is in many cases an arbitrary one, and it seems doubtful if group characters can be drawn with certainty from the structure of the pappus. It seems evident that *Oliganthes*, for example, with scaly pappus, is much more closely related to *Eremosis* and through it to *Vernonia*, both with capillary pappus, than to *Stokesia*, with scaly pappus. In certain species of *Vernonia*, especially *V. expansa*, the bristles of the inner series are flattened, and in the same genus the outer series is sometimes capillary, sometimes scaly. However, nothing better than the classification used by Bentham and Hooker has yet been suggested, and their system is followed in detail by Hoffmann.* The only difference is in the status of *Lachnorhiza*, regarded in the first work as a genus, in the second reduced to a section of *Vernonia*. Seven additional genera, described since the publication of the Genera Plantarum, are included by Hoffmann.

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* Genera Plantarum 2: 165–238. 1873.

In this paper the general divisions follow Bentham and Hooker, but there is some deviation in the delimitation of certain genera formerly included under *Vernonia* and *Elephantopus*. The segregation followed here is by no means new, but has been practiced by various botanists since Lessing, and is abundantly justified by its results. The segregated genera, *Lachnorhiza*, *Eremosis*, and *Leiboldia* in the one case, and *Orthopappus* and *Pseudelephantopus* in the other, represent each a natural coherent group of species, sharply delimited by the structure of the pappus, the inflorescence, or some other morphological characters, and also with definite, characteristic geographical distribution.

The two subtribes, Euvernonieae and Lychnophoreae, while entirely distinct, nevertheless approach each other in certain genera. The genus *Vanillosmopsis*, of the former subtribe, is in particular closely similar in inflorescence to *Eremanthus* of the Lychnophoreae. *Eremosis* and *Oliganthes* also have heads with few flowers more or less closely aggregated in panicles and apparently also approaching the Lychnophoreae. It seems probable, therefore, that these genera represent most nearly the primitive type of the Vernonieae, and that from similar forms the evolution of the tribe has proceeded. The structure of the existing genera indicates that this evolution has been along at least five different general lines, three of them preserving the general feature of aggregated heads with few flowers, constituting the Lychnophoreae, and at least two tending toward an open inflorescence and many-flowered heads, the Euvernonieae. In the latter group one line has resulted in the Sparganophoreae, in which the achene is surmounted by a cartilaginous ring. In *Sparganophorus* the ring alone is present; in *Pacourina* a row of bristles is within the ring, showing the direction from which the genera have come. A second line of evolution is shown in the genus *Vernonia* and its relatives, where the changes have been principally in the inflorescence, ranging from scorpioid forms with relatively few-flowered heads to paniculate forms with frequently many-flowered heads. It is not clear whether the subtribes Ethulieae and Stilpnopappeae represent different lines of descent, or whether the differentiation of a pappus into forms composed entirely of scales, of similar bristles, or of dissimilar series is to be regarded as indicating distinct lines of

* Engler and Prantl, Die Natürlichen Pflanzenfamilien 4^5: 120–131. 1894.

development or merely lateral branches of the Euvernonieae line. In the Lychnophoreae one line begins with *Eremanthus* and is characterized by the spirally arranged scales of the involucre. The species of this group are entirely South American. A second includes the Elephantopeae, in which the scales are decussate, and the third leads to the genera *Rolandra* and *Spiracantha*, in which the corolla is merely toothed, and the style-branches are short.

Within these series the genera are distinguished by the structure of the pappus, which may be scaly, of scales and bristles, entirely of bristles in one or more similar series or two dissimilar series, or certain bristles may be peculiarly modified; by the number of flowers in each head, which is found to be constant for each species within certain limits; and by the character of the inflorescence.

In 1898 there appeared a paper by Wettstein * in which the author presented in a very convincing manner the insufficiency of morphological comparison alone in studying the relationships and probable phylogeny of species. He introduced examples showing how conceptions of species may be changed by combining distributional with morphological studies, and his own results, particularly on the genera *Gentiana* and *Euphrasia*, are proof of the value of his method. Stated in a somewhat modified form, his principle is that in a polymorphic genus the most nearly related species will occupy the same or adjacent areas, or will at least be connected by definite migration routes. In studying the relationships of the species of Vernonieae in North America this geographical method has been used as far as possible, and while in but few cases it led to conclusions which would not have been reached by morphological comparison alone, it has invariably confirmed the results of the latter in a most striking way.

Naturally an abundant supply of herbarium material or of field notes is necessary for successful application of Wettstein's method, so that the range of species, both geographically and ecologically, and their variation can be definitely ascertained. It is also important that the general phytogeographical relationships should be known, with some accuracy, of the floras in which the species to be investigated are found. Under phytogeographical relationships are included such features as centers of distribution, migration routes,

* Grundzüge der geographisch-morphologischen Methode der Pflanzensystematik.

natural barriers and boundaries. For the United States and portions of Mexico these have been established with considerable detail, but for the West Indies, Central America and the greater portion of Mexico practically nothing is known. For the West Indies it is known that a definite migration route, for both animals and plants, extends northward from South America through the Lesser Antilles to Porto Rico, Hispaniola, Cuba, the Bahamas, and Florida. Minor centers of distribution among these islands are not so evident, but the number of species limited either to one island or to a few neighboring ones is so great that each may almost be regarded as a center in itself. The intervening water is certainly an effective barrier to the ready dissemination of many species.

In Mexico and Central America a similar migration route extends from South America into the United States, and it is an easy matter to trace the species of Vernonieae in the United States back to an origin in Mexico. But definitely circumscribed floral areas can not yet be located there because of lack of data. The work is still further hampered by the variation in altitude which is so great as to become of the highest importance for the distribution of plants in its relation to temperature and rainfall.

There are in the eastern United States several well-marked centers of distribution from which the various species of the flora have spread and are still spreading. Some of these are entirely northern and consequently of post-glacial origin, and have nothing to do with a genus of such tropical origin as *Vernonia*. Four fairly well-marked centers, two in the southeast and two in the southwest, lie south of the glacial boundary, and have existed at least since inter-glacial time. Each of these is characterized by certain species of Vernonieae, some of which have migrated to the northward since the retreat of the glacial ice.

The Appalachian center is the best known of these four, although it was not until 1902 that Adams * first recognized it as such and discussed it in detail. It includes the whole of the lower Appalachian region, and is marked both by the extraordinary number of species and by the occurrence of numerous relics, endemic species, and monotypic genera. Migration routes from this center extend to the north and northwest, mainly along the uplands, and by far the largest part of

* Southeastern United States as a center of geographical distribution of flora and fauna. Biol. Bull. 3 : 115–131. 1902.

the flora of the wooded portion of the eastern United States, north to the transition zone, can be referred to it.

South of this region and surrounding it on three sides lies the coastal plain. Although included with the southeastern center by Adams it is distinct from it, and is similarly characterized by a large number of endemic forms. From this center species have migrated to the northward and westward, following the coastal plain to New England and the river valleys to Nebraska and Minnesota. The peculiar flora of the swamps of southern Illinois and southeastern Missouri is directly due to the influence of this center, a fact already recognized by Bush.*

In the southwest lies a large, rather vaguely defined center in Texas, which may be spoken of as the Texan center. It has served as the origin of the greater number of species of the prairie province which extends northward from it. Of larger extent and less definitely bounded than the southeastern center it has correspondingly fewer endemic species, but its importance as a distributional center is not less.

The fourth or Ozarkian center was first recognized by Coulter,† who called attention to the presence there of four endemic genera of Umbellifers, and was also mentioned by Bush.‡ It includes the Ozark region of Missouri, Arkansas and Indian Territory, and extends also into Texas. Not only Umbellifers, but other genera and species are endemic here, and although of limited extent, the center has been of great importance in influencing the flora of the adjacent states and traces of its flora are seen even in southern Illinois.

Corresponding to these distributional centers two principal geographic divisions may be recognized among the species of Vernonieae in the United States, the one southeastern, the other southwestern. Neither has any standing from a purely morphological view, since they are not distinguished by any one set of morphological characters. Practically every type of foliage, pubescence, involucre, number of flowers or ecological habit found among the species in one division is repeated in one or more species of the other. But the phytogeographical diversity of the two is evident.

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*Rep. Missouri Bot. Gard. 5 : 140. 1894.

†Geographical distribution of North American Umbelliferae. Proc. Am. Assoc. Adv. Sci. 39 : 292–298. 1891.

‡L. c.

With the exception of *Vernonia altissima*, which extends westward well across the Mississippi river, the species of the two centers do not overlap. In this one case, *V. altissima* is in its western range confined entirely to the rich wooded alluvial bottom lands, a plant formation always recognized by phytogeographers as of southeastern origin. The southwestern species of the same region are invariably xerophytes of the uplands, or rarely hydrophytes of open swamps, associations normally characterized by southwestern species and in which *V. altissima* is never found. The ecological distinction between the two is therefore complete, for it is well known that ecological barriers of this nature may be more nearly insurmountable than hundreds of miles of distance alone.

The separation of these distributional centers dates back to the glacial period, and the two groups of Vernonieae have accordingly been separated since that time. It is also found that those species most nearly alike morphologically, such as *V. flaccidifolia* and *V. altissima*, or *V. fasciculata* and *V. Lettermanni*, are always distributed about the same center. These two statements lead inevitably to the conclusion that these groups of nearly related species are all of inter-glacial or post-glacial origin, so that groups separated on a geographical basis are at the same time separated phylogenetically as well. Considered in this light it is seen that the western plant described by Gray as *V. altissima grandiflora* can not possibly be a variety of that species, and that *V. texana* can not be grouped with *V. angustifolia* as has heretofore always been done.

Within the two divisions geographical evidence can not be given such a high rank, yet a study of distribution shows that of eleven species of *Vernonia* of the coastal plain but two are found inland, and that for but a minor part of their range; that of four Appalachian species two only extend a short distance into the coastal plain; and that the three Ozarkian species and the ten Texan species overlap in but two cases. Those are *V. Lettermanni*, endemic to the extreme southern part of the Ozarkian center, but clearly related to the Texan group Fasciculatae, and *V. interior*, which extends southward well into the Texan center. In each of these exceptions the morphological evidence is so apparent that there is in no case any doubt as to the relationship of the species concerned.

Another point that can be satisfactorily studied by the geographical method only is the relation of a species as a whole to its various

subspecies or forms. It may best be illustrated by two examples. The two forms described as *V. Baldwini* Torr. and *V. interior* Small were regarded by Mackenzie and Bush as two forms of one species; the former was reduced to a variety of the latter, and a new name, *V. interior Baldwini*, was published. The same course is followed in this paper. Nomenclatorially the name should be *V. Baldwini interior*, since *Baldwini*, the oldest name, must apply to the species according to current rules of nomenclature. However, *V. Baldwini* is not the species, but only a local eastern form of the more widely distributed *V. interior*. This is shown by the migration routes of species from the Ozarkian center. One of them extends northeast through southern Missouri into Illinois, and it is along this extension that the variety occurs. If species migrated in the other direction, from Illinois toward Arkansas, which is not the case, then there would be some reason for regarding *V. interior* as the variety. A second and similar case is that of *V. ovalifolia*, which, as its morphological structure shows, belongs to the group Altissimae of the Appalachian center. The Floridian form of the plant with different foliage is therefore a variation from the normal, although unfortunately the type specimens of Torrey and Gray belong to it. Further details of the significance of geographical distribution will be given under the appropriate genera and species.

In the treatment of the species and genera keys have been given to all the species whose validity has been admitted. Some descriptions have been inaccessible, and a few others are so fragmentary that the names must be regarded as *nomina subnuda*. Specific descriptions have been included in most cases, but omitted for the commoner well-known forms. Specimens have been cited in many cases where the species are obscure or little known. The nomenclature naturally follows the principles set forth in the Philadelphia Code of 1904.* Especial care has been taken to ascertain the specific type of each genus, since it is believed that final stability of nomenclature can only be attained by grouping the species of a genus around one definite type. In one case only is a name introduced in direct contravention of the rules cited; that of *Vernonia interior Baldwini* already mentioned. In that case it would be opposing the known facts of the relationship of the two forms if the code were followed in detail, an event certainly neither expected nor desired by its founders.

* Bull. Torrey Club 31 : 249–290. 1904.

VERNONIEAE Cass. Bull. Soc. Philom. 1815: 173. 1815

Carduaceae; heads homogamous, hermaphrodite; scales of the involucre loosely or closely imbricated in few or several series, or rarely few and not imbricated; receptacle flat or subconvex, normally smooth or pitted, rarely hairy, bristly or chaffy; corolla white to red or blue, never yellow, regularly toothed or lobed, rarely irregularly lobed (Elephantopeae) or subligulate (*Stokesia*); anthers sagittate at base or in some genera subcaudate; style-branches slender, tapering, acute, hairy without, stigmatose within; achene terete or subterete, ten-angled or ten-costate, by reduction or interposition 3–20-costate; pappus none, or of bristles, scales, or scales and bristles, in one or more series. Herbs, shrubs, vines or small trees, with alternate, entire to serrate leaves.

Conspectus of North American Genera

1. Subtribe EUVERNONIEAE. Heads separate

Pappus a cartilaginous ring.
- Bristles none. — 1. *Struchium.*
- Bristles present within the ring. — 2. *Pacourina.*

Pappus of scales, bristles, or both scales and bristles.
- Pappus very deciduous; outer involucral scales foliaceous. — 3. *Centratherum.*
- Pappus persistent, of bristles or of bristles and scales.
  - Anthers subcaudate at base; heads in axillary clusters. — 4. *Piptocarpha.*
  - Anthers obtuse at base.
    - Bristles of the pappus in one or more series, uniform in length.
      - Leaves all basal. — 5. *Lachnorhiza.*
      - Cauline leaves present. — 6. *Leiboldia.*
    - Bristles of the pappus in two series, the outer much shorter than the inner.
      - Heads 8–88-flowered; scales of the involucre persistent. — 7. *Vernonia.*
      - Heads 1–5-flowered, in rounded panicles. — 8. *Eremosis.*
- Pappus persistent, of scales.
  - Receptacle chaffy. — 11. *Bolanosa.*
  - Receptacle not chaffy.
    - Corollas irregularly lobed, appearing subligulate. — 12. *Stokesia.*
    - Corollas tubular, regularly lobed.
      - Heads 1–8-flowered. — 9. *Oliganthes.*
      - Heads 8-flowered or more. — 10. *Piptocoma.*

2. Subtribe LYCHNOPHOREAE. Heads aggregated into secondary capitula or glomerules

Corolla 5-cleft; style deeply 2-lobed; involucral scales 8 or more.
- Pappus-bristles all alike, straight.

Bristles numerous, not enlarged at base. 13. *Orthopappus.*
Bristles 5, dilated at base. 14. *Elephantopus.*
Pappus-bristles dissimilar, two lateral ones longer and conduplicate near the apex. 15. *Pseudelephantopus.*
Corolla 3–5-toothed; style-branches short; involucral scales 2–5.
Involucral scales 2; pappus a persistent toothed crown. 16. *Rolandra.*
Involucral scales 5; pappus of deciduous separate scales. 17. *Spiracantha.*

1. STRUCHIUM P. Browne, in St. Hilaire, Expos. 1: 406. 1805

Heads many-flowered, single or clustered in the axils of the leaves; involucre hemispheric, scales many, imbricated in several series, the outer shorter; receptacle subconvex; corolla purple, 3–4-lobed; achenes 3–4-angled and ribbed, glabrous or minutely glandular, truncate at the apex, surmounted by a persistent, shallowly lobed or entire cartilaginous crown. Herbaceous, erect, simple or sparingly branched, internodes short, leaves petiolate, pinnately veined.

A monotypic genus of tropical America, introduced into Africa.

STRUCHIUM SPARGANOPHORUM (L.) Kuntze, Rev. 1: 366. 1891

Ethulia sparganophora L. Sp. Pl. ed 2. 1171. 1763.

Sparganophorus Vaillantii Crantz, Inst. 1: 261. 1766.

Struchium herbaceum P. Browne, in St. Hilaire, Expos. 1: 406. 1805.

Struchium americanum Poir. Encyc. 7: 475. 1806.

Characters of the genus. Erect, 2–10 dm. high; stem puberulent or glabrate; leaves thin, elliptic to lanceolate, acuminate, serrate, glabrous or nearly so, 5–12 cm. long; petioles slender, 1–2 cm. long; heads sessile, 6–9 mm. in diameter, about 50-flowered; involucral scales acuminate, scarious on the margins; achenes oblong, quadrangular, ribbed at the angles, the crown nearly white, half the length of the achene.

Type locality: "Habitat in India."

Distribution: Cuba and southern Mexico south to Brazil, in wet places and along streams.

The name *Struchium* was not validly published until 1805, although in 1756 it was used for the plant by Patrick Browne,* without the publication of a binomial name. The same objection applies to Adanson's *Athenaea*.† The type of *Sparganophorus*‡

* Civ. & Nat. Hist. Jam. 312, *pl. 34. f. 12.*

† Fam. 2: 121. 1763.

‡ Crantz, Inst. 1: 261. 1766.

is *Sparganophorus Ethulia* Crantz (*Ethulia conyzoides* L.), the first species cited. The use of the name is also invalidated by Adanson's *Sparganophorus*,* published three years earlier and based on a plate of Clusius representing some Anthemideous plant.

2. PACOURINA Aubl. Pl. Gui. **2**: 800. 1775

Haynea Willd. Sp. Pl. **3**: 1787. 1804.

Pacourinopsis Cass. Bull. Soc. Philom. **1817**: 151. 1817.

Heads axillary, many-flowered, sessile; involucre broadly depressed-hemispheric, its scales scarious, appressed and closely imbricated at the base, herbaceous and spreading at the apex; receptacle flat; corolla regular, deeply 5-cleft; anthers sagittate, the lobes obtuse at the base; styles long-exserted; achenes prismatic, elongated, pubescent, obscurely 10-ribbed, tipped with a minute denticulate or entire cartilaginous ring, within which are about two rows of short, deciduous, hispid bristles more or less connected at the base. Tall erect herbs with large thin dentate or runcinate thistle-like leaves and extremely large heads.

One polymorphic species in tropical America.

PACOURINA EDULIS Aubl. *l. c.*

Haynea edulis Willd. *l. c.*

Pacourinopsis integrifolia Cass. *l. c.*

Pacourinopsis dentata Cass. *l. c.*

Pacourina cirsiifolia H.B.K. Nov. Gen. **4**: 30. 1818.

Characters of the genus; leaves 15–20 cm. long, 5–8 cm. wide, deeply and irregularly serrate with spinous teeth; heads 3 cm. wide and high; achenes 1 cm. long.

Type locality: French Guiana.

Distribution: Hispaniola, *Wright*, *Parry & Brummel;* Nicaragua, *Levy 103;* and through tropical South America. Its occurrence in North America in but two widely separated stations would indicate that it is an introduced species.

Aublet's original had leaves merely remotely denticulate. The form with deeply serrate leaves, like the two North American plants, was separated by Cassini as distinct, under the name *Pacourinopsis dentata* (*Pacourina cirsiifolia* H.B.K.).

3. CENTRATHERUM Cass. Dict. Sci. Nat. **7**: 383. 1817

Amphirephis H.B.K. Nov. Gen. **4**: 32. 1818.

Spixia Schrank, Pl. Rar. Hort. Monac. *pl. 80.* 1821.

* *L. c.*

Involucre hemispheric or broadly campanulate; scales in several series, the outer foliaceous and spreading, the intermediate and inner erect or appressed, membranous or scarious; heads many-flowered; receptacle subconvex, corollas deeply 5-cleft, purplish or blue; anthers sagittate, obtuse at the base; achenes ribbed; pappus-bristles few to many, short, caducous. Herbaceous, diffusely branching, with petioled serrate leaves; heads peduncled, usually terminating the branches.

Type, *C. punctatum* Cass.

Twelve species, according to Hoffmann, most of which are Old World forms, and probably not congeneric with the four or five New World species. In America *Centratherum* is characteristic of tropical South America, and none of the species extends much beyond it.

Inner scales obtuse or rounded at the apex, ciliate-denticulate with glandular hairs and more or less glandular on the back. 1. *C. intermedium.*

Inner scales rounded to aristate, the margin minutely glandular or not at all, arachnoid or tomentose on the back.

Inner scales obtuse or acute, mucronate or aristate, the intermediate with awns 2 mm. or more in length. 2. *C. punctatum.*

Inner scales obtuse or rounded, the intermediate with awns less than 1 mm. long or none. 3. *C. muticum.*

1. Centratherum intermedium (Link) Lessing, Linnaea 4: 320. 1829

Amphirephis intermedia Link, Abb. K. Bot. Gart. Berlin. 65. 1820.

Spixia violacea Schrank, Pl. Rar. Hort. Monac. *pl. 80.* 1821.

Erect, with ascending branches, 3–5 dm. high; stem stout, somewhat angled, puberulent; leaf-blades thin, ovate to oblong-ovate, obtuse or subacute, deeply crenate-serrate, glabrous above, puberulent beneath, abruptly arcuately narrowed at base into a long margined petiole; length of blade and petiole 3–4 cm., width 1–1.8 cm.; heads on terminal peduncles; outer scales 5–9, 1.5–2.5 cm. long, foliaceous, in shape and texture resembling the foliage leaves; intermediate scales scarious, ovate to ovate-lanceolate, acuminate into a prominent awn, glabrous except some arachnoid tomentum near the base of the awn; inner scales rounded to subacute at the tip, ciliate with short glandular hairs and somewhat glandular on the back; achenes obovoid, prominently ribbed.

Type locality: Brazil.

Distribution: Martinique, *Duss 1734*, and Guadeloupe, *Duss 2526*, to Brazil.

2. CENTRATHERUM PUNCTATUM Cass. Dict. Sci. Nat. 7: 384. 1817

Amphirephis aristata H.B.K. Nov. Gen. 4: 32. 1818.

No North American specimens of this species have been seen, and it is admitted to the North American flora only on the report of Seemann,* who listed it from the Isthmus of Panama. The following characterization is taken from Colombian plants, *Holton 301* and *André 1727*, in the Gray Herbarium.

Erect, 4 dm. high, stem puberulent; leaves firm, lanceolate or oblong-lanceolate, 2–3 cm. long, 4–7 mm. wide, acute, serrulate or entire, attenuate at base into a margined petiole, glabrous above, puberulent beneath; outer scales of the involucre similar to the leaves, but little exceeding the head; intermediate scales pubescent near the tip, abruptly narrowed into an awn 2–4 mm. long; inner scales obtuse or acute, spinulose-denticulate, mucronate or short-awned.

Type locality: Isthmus of Panama.

Distribution: Panama and Colombia.

3. CENTRATHERUM MUTICUM (H.B.K.) Lessing, Linnaea 4: 320. 1829

Amphirephis mutica H.B.K. Nov. Gen. 4: 32. 1818.

Stem pubescent; leaves rather thick, pubescent on both sides, sharply serrate, gradually attenuate at base, 1.5–2 cm. long, 5–7 mm. wide; outer involucral scales equaling or a little longer than the heads, the intermediate acute or with short awns, the inner obtuse to rounded, not glandular-ciliate, arachnoid or sparsely glandular.

Type locality: "Nova Andalusia."

Distribution: Mexico (*fide* Kew Index), Colombia, *Otto*.

4. PIPTOCARPHA R. Br. Dict. Sci. Nat. 41: 109. 1826

Carphobolus Schott; Sprengel, Syst. Veg. Cur. Post. 409. 1827.
Monanthemum Griseb. Fl. Brit. W. Ind. 354. 1864.

Heads few- (3–20-) flowered, aggregated in axillary or terminal corymbs, umbels or panicles, or sessile in axillary clusters; involucre ovoid or campanulate; scales imbricated in several series, the outer smaller, the inner frequently falling with the achenes; corolla 5-cleft; anthers sharply subcaudate at base; achenes truncate, ribbed; pappus-bristles in two series, the inner long, equal, the outer much shorter, unequal, inconspicuous or apparently in some

* Bot. Voy. Herald 140.

species none. Shrubs, frequently climbing; leaves large, usually entire, coriaceous, and tomentose with stellate hairs or scaly beneath.

Type, *P. brasiliana* Cass. Dict. Sci. Nat. 41: 109. 1826.

Species about 28, in the American tropics from Mexico and Porto Rico to Brazil.

In the original description of the genus * Brown did not cite or describe a species. The next author to use the name was Cassini, who without seeing any specimens gave the specific name *brasiliensis* to the plant described by Brown, using for that Brown's own characters. *P. brasiliana* is not mentioned by Baker in his treatment of the genus in the Flora Brasiliensis, but it is evidently *P. umbellulata* Baker (=*P. Brownii* DC.).

Heads mostly 6-flowered, corymbose in the axils. 1. *P. chontalensis.*
Heads mostly 4-flowered, in terminal corymbiform clusters. 2. *P. tetrantha.*

1. Piptocarpha chontalensis Baker, Fl. Brasil. 6^2: 132. 1873

Piptocarpha costaricensis Klatt, Prim. Fl. Costar. 1^2: 120. 1893.

Shrubby; branches faintly striate or terete, slightly flexuous, thinly cinereous-tomentose; leaves coriaceous, oblong-ovate to ovate, 10–18 cm. long, 4.5–10 cm. wide, acute or abruptly short-acuminate, entire or remotely denticulate, obliquely and unequally rounded at the base, dark-green, glabrous and shining above, dull-green and closely cinereous beneath, the petioles 1–1.5 cm. long; bracteal leaves similar but smaller; heads numerous, crowded in axillary corymbiform clusters, 6-flowered, sessile in clusters of 2–3 terminating tomentose peduncles; involucre ovoid, 3–4 mm. high; scales closely imbricated, appressed, ovate, obtuse or rounded, the outer tomentose, the inner glabrous except the tomentose tip, deciduous; achenes sharply 5-ribbed with 5 secondary less prominent ribs, 3 mm. long, glabrous or with a few scattered hairs; pappus white, 6-7 mm. long, bristles of the outer series short, barely distinguishable from the inner.

Type locality: "Nicaragua in ditione Chontales."

Distribution: Guatemala, *Türckheim 7892*, *Watson 326*, Costa Rica, *Pittier 4927*, *12153*, *3704*, *Donnell Smith 6613*, *4846*, *Tonduz 13276*, and Nicaragua.

A well-marked species, rather variable in leaves and pubescence. Klatt's species is founded on a Costa Rican form with leaves more than half as wide as long and finely gray-tomentose beneath. The

* Trans. Linn. Soc. 12: 121. 1816.

Guatemalan plants tend to show relatively narrower leaves, less broadly rounded below, and with a softer grayish-brown tomentum. Baker's type was probably like the latter, since in his description he speaks of oblong leaves, pale brown-pubescent beneath. However, the two cannot be specifically separated.

2. Piptocarpha tetrantha Urban, Symb. Ant. 1: 457. 1900

Shrubby; branches striate, closely and finely cinereous-pubescent; leaves broadly elliptic to elliptic-oblong, 3.5–10 cm. long, 2–4 cm. wide, obtuse or rounded, entire, rounded at base, coriaceous, dark-green, glabrous and shining above, finely cinereous-tomentose beneath, prominently reticulately veined, the petioles 1–1.5 cm. long, dilated; heads 4-flowered, sessile, aggregated in clusters of 2–4 in a dense small terminal panicle; involucre ovoid, 6 mm. long; scales closely imbricated in few series, all appressed, the outer short, ovate, tomentose, the inner oblong, glabrous below, densely tomentose at the tip; achenes 3–4 mm. long, glabrous, 10-ribbed; pappus 4–6 mm. long, tawny-white, the outer series short.

Type locality and distribution: Porto Rico.

The two sheets examined present striking dissimilarity in the foliage. In one, *Sintenis 6084*, the leaves are of an oblong type, 8–10 cm. long and about two and a half times as long as wide; in the other, *Sintenis 4017*, they are broadly ovate-elliptic, the largest only 5 cm. long, and over half as wide. There is apparently no other difference between the two. This species has been referred to in literature as *Piptocarpha triflora* Baker, a Brazilian species which it closely resembles.

Excluded Species

Piptocarpha sexangularis Klatt * has opposite leaves, with connately dilated petioles, multistriate scales and uniseriate pappus. It belongs probably to the Eupatorieae, certainly not to the Vernonieae.

5. LACHNORHIZA Rich. in Sagra, Hist. Fis. Pol. Nat. Cuba 11: 34. 1850

Heads many-flowered; involucral scales imbricated in few series; receptacle flat; corolla regular, 5-cleft; anthers sagittate, the lobes acute at the base; achenes prismatic, obscurely ribbed; pappus capillary, of numerous bristles in one series. Scapose perennial

* Bull. Soc. Bot. Belg. 35: 278. 1896.

herbs bearing 1–4 heads in a corymbiform cluster; leaves arising from a densely woolly crown.

Probably a monotypic Cuban genus, although Hoffmann refers here some little-known scapose African forms.

LACHNORHIZA PILOSELLOIDES Rich. *l. c.*

Lachnorrhiza asteroides Griseb. Cat. Pl. Cuba 152. 1866.

Characters of the genus; leaves spatulate or oblong-spatulate, acute or obtuse, entire, gradually narrowed below into a margined pubescent petiole, glabrous above, sparingly pubescent beneath, 5–14 cm. long including the petiole, 1–2 cm. wide, the lateral veins obscure; scape erect, puberulent, 1.5–3 dm. high, peduncles subtended by subulate bracts; involucre campanulate, 8 mm. high; scales all erect, loosely imbricated in few series, pubescent and glandular, the outer triangular-lanceolate, the inner oblong to oblong-lanceolate, acute; achenes 2.5 mm. long, glabrous, with a prominent basal callus; pappus tawny, 6 mm. long.

Type locality: "In insula Pinorum."

Distribution: Cuba and the Isle of Pines.

The status of the genus has long been doubtful. Its author recognized its relationship to *Vernonia* and included it in the same tribe. His principal reason for distinguishing it generically was the acuteness of the bases of the anthers. Grisebach, for the same reason, regarded it as related to the Inuleae, to which tribe he transferred it. Bentham and Hooker placed it among the Vernonieae again, separating it from *Vernonia* principally because of its scapose habit. This feature, however, is shared by *Vernonia acaulis*, and the involucral characters of the two are much the same. Hoffman reduced the genus to a section of *Vernonia*, although quoting the original name for the species. All of these later authors have overlooked the uniseriate pappus, a character mentioned in Richard's original description. Since in this paper the presence of two unequal series of pappus-bristles has been taken as a criterion of *Vernonia*, *Lachnorhiza* has, for this reason as well as its other structural peculiarities, been kept as a distinct genus.

6. LEIBOLDIA Sch.-Bip. Linnaea 19: 742. 1847

Heads very large, many-flowered, crowded in dense corymbiform clusters; involucre broadly hemispheric or campanulate, the scales very many, imbricated in numerous series, acuminate to rounded; receptacle flat or subconvex; corolla regular, the tube slender, the limb deeply 5-cleft; anthers sagittate, obtuse at the base; achenes

glabrous, prominently angled, surmounted by a narrow or broad callus-ring; pappus in 2–3 series, capillary, its bristles all equal or nearly so, at least not in two unequal series. Shrubs with pubescent or tomentose stems and large rugose obovate leaves, usually scabrous above and tomentose beneath.

Type, *Vernonia Leiboldiana* Sch.-Bip.

Four species, natives of southern Mexico. Distinguished from *Vernonia* primarily by the structure of the pappus, the genus has also a very different habit, due to the huge crowded heads and large broadly obovate leaves. The callus-ring surmounting the achenes becomes obscure at maturity.

Leaves thin; heads peduncled; scales glabrous or nearly so, acute to obtuse, the principal ones about 4 mm. wide.
  Leaves green beneath, merely strigose. 1. *L. Salvinae.*
  Leaves cano-tomentose beneath. 2. *L. mexicana.*
Leaves thick; heads nearly sessile; scales pubescent or tomentose, regularly tapering to a long point, the principal ones 2 mm. wide.
  Scales prominently carinately nerved; achenes tipped with a narrow callus ring. 3. *L. Leiboldiana.*
  Scales not prominently nerved; achenes usually tipped with a broad callus ring. 4. *L. serrata.*

1. Leiboldia Salvinae (Hemsley) nom. nov.

Vernonia Salvinae Hemsley, Biol. Cent. Am. Bot. 2: 73. 1881.

Herbaceous or shrubby; younger branches ferruginous-tomentose, becoming glabrate with age; cauline leaves membranous, oblong-oblanceolate to narrowly obovate, 15–25 cm. long, 4–7 cm. wide, short-acuminate, narrowed below into short petioles, rather remotely serrate with low callous teeth, pinnately veined, puberulent above, especially along the midvein, strigose-hirsute beneath; heads 1–5, on peduncles 3–7 cm. long: involucre broadly campanulate, 15 mm. high; scales thin, purple, somewhat spreading at the tip, ovate to oblong, rounded to subacute at the apex, or the innermost acuminate, puberulent and glandular, especially near the tips; achenes sharply 4–5-angled, with a prominent callus-ring; pappus tawny, about 7 mm. long.

Type locality: Guatemala.

Distribution: Chiapas, Mexico, *Nelson 3747*, to Guatemala and Costa Rica, *Wercklé 11604*.

L. Salvinae is a little-known species poorly represented in herbaria. Hemsley made no mention of the structure of the pappus, although he described the tetragonal achenes. Its supposed relationship to *Vernonia Alamani* DC. is merely one of habit, the two differing completely in the structure of pappus and achenes.

2. Leiboldia mexicana (Lessing) nom. nov.

Vernonia mexicana Lessing, Linnaea **6**: 680. 1831.
? *Vernonia Salvinae canescens* Coulter, Bot. Gaz. **16**: 95. 1891.

Shrub with ferruginous-tomentose branches; leaves thin, obovate, abruptly short-acuminate, mucronulately serrulate, regularly tapering to the base, nearly smooth above, thinly cano-tomentose beneath, pinnately veined, 20 cm. long, 15 cm. wide, *fide* Lessing; petioles tomentose, *fide* Lessing 3.5–5 cm. long; heads pedunculate; involucre broadly hemispheric, 2 cm. high, 3 cm. broad; scales glabrous, thin, loosely imbricated, the outer ovate, broadly rounded and somewhat spreading at the tip, the inner acute or subacute, exposed portion of the principal scales 4–5 mm. wide; mature achenes and pappus not seen.

Type locality: Cuesta grande de Chiconquiaco.

Distribution: Southern Mexico.

The single specimen examined is in the Klatt collection in the Gray Herbarium, and consists of a detached leaf 11 cm. long by 5 cm. wide, and a flowering branch bearing a few peduncled heads. There is no indication of the date or collector, except that it apparently antedates DeCandolle's Prodromus. If so it may possibly be a fragment of Lessing's original. Specimens of Coulter's variety have not been seen, and it is referred here merely because of its tomentose leaves.

3. Leiboldia Leiboldiana (Sch.-Bip.) nom. nov.

Vernonia Leiboldiana Sch.-Bip. Linnaea **19**: 742. 1847.
Leiboldia ovata Sch.-Bip. *l. c.*

Shrub 1–2 m. high, sparingly branched; stems stout, strongly angled, densely cinereous-tomentose; leaves thick, subcoriaceous, obovate, 14–24 cm. long, 7–12 cm. wide, acute or abruptly short-acuminate, sharply mucronately serrate, regularly tapering to a rounded, truncate, or subcordate base, dull-green and scabrous above, densely and softly cinereous beneath; lateral veins prominent; veinlets reticulated, sessile or short-petioled; uppermost leaves much smaller; heads numerous, sessile or nearly so, densely aggregated; involucre hemispheric or broadly campanulate, 16 mm. high; scales erect, tomentose, especially near the base, the outer ovate, the inner oblong-linear, all regularly tapering into a long acuminate tip; achenes 2.5 mm. long, sharply 4–5-angled, with or without secondary intermediate ribs, surmounted by a narrow callus-ring; pappus white, fragile, 1 cm. long.

Type locality and distribution: Mexico.

Here are referred the following exsiccatae: *Botteri 603*, *Prin-*

gle 6085, and *Conzatti & González 1111*, as well as several other older specimens. The carinate midnerve of the involucral scales is perhaps the most constant character separating it from the next. Their tips are pubescent rather than tomentose and tend to become glabrous with age.

4. **Leiboldia serrata** (Don) nom. nov.

Diazeuxis serrata Don, Trans. Linn. Soc. **16**: 254. 1830.
Vernonia arctioides Lessing, Linnaea **6**: 400. 1831.
Leiboldia arctioides Sch.-Bip. Linnaea **19**: 743. 1847.

In foliage and general habit resembling *L. Leiboldiana*, but distinguished by the involucral scales, which are not carinately nerved, but rather striate, and more tomentose at the tip, and the achenes, which are tipped with a yellowish callus-ring about 0.5 mm. wide.

Type locality and distribution: Mexico. Orizaba, *Müller 329, 955, 1440* (one specimen); Chiconquiaco, *Schiede 1238*. The latter is one of the originals of Lessing's *Vernonia arctioides*.

7. VERNONIA Schreb. Gen. Pl. **2**: 541. 1791

Suprago Gaertn. Fruct. **2**: 402. 1791.
Baccharoides Moench, Meth. 578. 1794.
Ascaricida Cass. Dict. Sci. Nat. **3**: Suppl. 38. 1816.
Lepidaploa Cass. Bull. Soc. Philom. **1817**: 66. 1817; and Dict. Sci. Nat. **26**: 16. 1823.
? *Achyrocoma* Cass. Dict. Sci. Nat. **26**: 21. 1823.

Heads homogamous, 8–many-flowered; involucre narrowly campanulate to hemispheric, its scales loosely or closely imbricated in few or many series, the outer successively shorter; receptacle flat or subconvex; corollas regular, the limb 5-cleft; anthers sagittate at the base, not prolonged into caudate appendages; achenes ribbed or ribless, truncate; pappus in two series, the outer short, of scales or bristles, the inner long, capillary.

Herbs or shrubs, nearly all the species perennial, with usually leafy stems, branching at least at the inflorescence; heads in scorpioid cymes, paniculate cymes, solitary in the axils, or terminal. About 600 species, of temperate and tropical America, Asia and Africa.

Nomenclatorially the genus is grouped about the type species *V. noveboracensis*, that being the first of Dillenius' species cited by

Schreber to receive a binomial name. A large number of generic synonyms belong to the genus as a whole, but only five of these apply to North American species. *Suprago* Gaertn. was published in the same year as *Vernonia*, and there is apparently no evidence which of them is the older. It is typified by *Suprago glauca* (*V. glauca* Willd.). *Baccharoides* and *Ascaricida* both refer to *V. anthelmintica*, *Lepidaploa* is based on *V. scorpioides*, and since the publication of the Prodromus has been used as a sectional name. The identity of Cassini's *Achyrocoma tomentosa* (*V. Achyrocoma* Lessing) is uncertain and the name is treated here as a *nomen nudum*.

The genus *Vernonia*, even after the segregation of the forms here placed in *Lachnorhiza*, *Leiboldia* and *Æremosis*, is still a huge aggregation presenting striking variation in the structure of the inflorescence and involucre. Comparing some of the extreme forms, such as *V. bahamensis*, *V. arborescens* and *V. crinita*, the diversity seems almost sufficient to warrant their separation into distinct genera. Eight genera could be constructed from the North American species if these extremes were taken as types. But examination of all the species shows that these diverse forms are all derived one from the other and in most cases it is easy to trace the connecting links. *V. bahamensis* and its relatives, here placed in the subsection *Scorpioideae reductae*, may be easily connected through *V. albicaulis* to normal scorpioid forms; *V. buxifolia* and the allied species, constituting the *Scorpioideae aggregatae*, show a similar relationship through *V. acuminata*. The close relationship of the *Scorpioideae foliatae* and *Scorpioideae aphyllae* is obvious. By repeated branching of the cymes in the latter arise such forms as *V. canescens*, in which the inflorescence assumes a pseudo-paniculate appearance. By the shortening of the individual cymes an inflorescence like that of *V. scabra* is produced; from that to the true *Paniculatae* is but a short step. There is, accordingly, from one extreme to the other an almost unbroken series of intermediate forms making the segregation of genera impossible. The two Old World species, *V. anthelmintica* and *V. cinerea*, belong to different sections of the genus and there are stronger reasons for removing them, an action which has however been deemed inadvisable.

Within this vast assemblage certain groups of species stand in relief from their marked resemblance one to the other. As a con-

venient example may be mentioned *V. arborescens* and its relatives, all with a similar structure of inflorescence, with hirsute achenes, normally ovate leaves, a definite type of pubescence, and above all a definite and typical habit. These species-groups are in general characterized by a community of morphological features rather than by any definite and peculiar structures, and as a rule the component species occupy the same or adjacent territory. There is good evidence that the groups in the United States include naturally related species of common ancestry; the presumption is that the groups in the tropics have the same value. But since all the species of *Vernonia* may be considered to have also a common ancestry, the delimitation of large or small species-groups becomes merely a personal matter.

The seven subsections of *Lepidaploa* by no means represent groups of equal value. The *Scorpioideae reductae* and *Scorpioideae aggregatae* are certainly derived directly from the *Scorpioideae foliatae*, and are therefore subsidiary to it and not parallel with it. Among the *Paniculatae* the *dichotomae* and *verae* are undoubtedly phylogenetically distinct, the latter being closely related to the *Scorpioideae aphyllae* through a Mexican ancestry, while the former is endemic to Cuba and doubtless derived from forms similar to *V. havanensis*.

Geographically the North American species may be traced back to an ultimate origin in South America. This is shown by the increase towards the south in number of species and in variety of structure and also by the fact that forms intermediate between species-groups invariably occur to the southward of them. Thus in the group *Longifoliae*, *V. longifolia* is most closely related to the more typical scorpioid forms and is distributed through the Windward Islands. Northward, in Porto Rico and Hispaniola is the related *V. albicaulis*, while derived from or closely related to that species is the subsection *Scorpioideae reductae* of Cuba and the Bahamas. The migration route through the Windward Islands into the Greater Antilles has been followed almost exclusively by the *Scorpioidcae foliatae*. The western route through Central America has been followed mostly by *Scorpioideae aphyllae*, and, further to the north by *Paniculatae*. Some of the more primitive forms of the latter, such as the *Texanae*, reach the southwestern United States. More specialized members of the same subsection have occupied the entire southeastern portion of the United States,

and one species even occurs in the Bahamas. The two extremes of the different routes have therefore at last met.

The species of the genus usually show definite characters, allowing their exact separation. Intermediate forms are nevertheless abundant, and have frequently been referred to hybridization. There is, however, no evidence whether they are hybrids or merely chance variations. In general the change from the normal is in but one or two characters, such as the shape, pubescence or serration of the leaves or the shape of the involucral scales, and it is seldom difficult to determine the specific identity of the variants. Within the species there is often great variability, and extreme forms have frequently been regarded as distinct. Thus there is an unbroken series of forms between typical *V. gigantea* and *V. oligantha*, or between *V. interior* and *V. Baldwini*, and in each case the two must be reduced to one single species.

The number of flowers in each head has frequently been used as a basis for separating species and has been found quite constant within certain limits. The number follows closely the phyllotactic series 8, 13, 21, 34 and 55. The series may be constructed by adding each two numbers to form the next higher. An intermediate series may be constructed by omitting one number and adding each alternate two. This series includes the numbers 11, 18, 29 and 47. In practice the ripe achenes are counted, pulling them from the involucre by forceps, and the number, if none is abortive, is invariably found to correspond closely with some of the series. The lowest numbers, 8, 11, and 13, are usually followed exactly; the upper ones may vary one or two in either direction. In the descriptions the variations have seldom been taken into account, and only the typical number is indicated, thus 8 in *V. Lettermanni*, 13 in *V. concinna* and 21 in *V. fasciculata*.

Key to the North American Species

Some or all of the involucral scales constricted below a membranous green leaflike appendage. Section Baccharoides.

Involucral scales membranous or scarious, but without a conspicuous green terminal appendage.

Achenes terete, without ribs, or faintly ribbed. Section Tephrodes.

Achenes ribbed or furrowed. Section Lepidaploa.

Section Baccharoides

One species in North America. 1. *V. anthelmintica*.

Section TEPHRODES

One species in North America. 2. *V. cinerea.*

Section LEPIDAPLOA

Some or all of the heads sessile, in scorpioid cymes of 1–many heads.

Cymes elongated, simple or branching, bearing usually numerous heads, each subtended by a bracteal leaf. I. *Scorpioideae foliatae.*

Cymes reduced to 1–4 heads, which therefore frequently appear sessile in the axils of the upper leaves. II. *Scorpioideae reductae.*

Cymes much shortened, the heads appearing aggregated in capitate or subcapitate clusters. III. *Scorpioideae aggregatae.*

Cymes elongated, simple or freely branched, bearing usually numerous heads, which are not subtended by bracteal leaves. IV. *Scorpioideae aphyllae.*

Heads mainly peduncled, in corymbiform or paniculate clusters, not scorpioid or racemose.

Branches of the inflorescence repeatedly dichotomously branched, the internodes successively and uniformly decreased in length, forming regular rounded panicles. V. *Paniculatae dichotomae.*

Branches of the panicle aggregated or separated by short internodes, peduncles all about the same length, forming subumbellate rounded panicles. VI. *Paniculatae umbelliformes.*

Branches of the panicle irregular in length, the uppermost heads sessile or short-peduncled, the lower on more elongated peduncles, forming crowded or lax, irregular or depressed panicles. VII. *Paniculatae verae.*

I. SCORPIOIDEAE FOLIATAE

* Involucre 8–10 mm. high, its scales subulate, straight, erect or somewhat spreading, not appressed, or only at the base.

† Leaves acute or acuminate, hirsute to glabrate. ARGYROPAPPAE.

Leaves of an oblong type, broadest above the middle, attenuate at base.

Leaves 8–12 cm. long, softly and densely hirsute beneath. 3. *V. argyropappa.*

Leaves 6 cm. long or less.

Leaves scabrellate above, sparsely pilose or glabrate. 4. *V. acilepis.*

Leaves pilose on both sides. 5. *V. remotiflora.*

Leaves of an ovate type, broadest below the middle, obtuse at base. 6. *V. hirsutivena.*

†† Leaves obtuse, bullate above, densely tomentose beneath. PINETICOLAE. 7. *V. pineticola.*

** Involucre 4–5 or rarely 7 mm. high, its scales not subulate, appressed or barely spreading, irregularly imbricated in a few series.

† Cymes elongated, bearing numerous heads.

‡ Inner scales acute or acuminate.

a. Heads 1–3 cm. distant, at least at maturity; leaves not excessively hirsute with long hairs beneath.

1. Leaves of an ovate or oblong type, exceeding 1 cm. in width. ARBORESCENTES.

Leaves whitened or sericeous beneath.
  Leaves hirsute beneath, with silvery or sericeous hairs.
    Pappus brown. 8. *V. phyllostachya.*
    Pappus white. 9. *V. venusta.*
  Leaves tomentose beneath.
    Leaves flat. 10. *V. sublanata.*
    Leaves deeply rugose or bullate. 11. *V. gnaphaliifolia.*
Leaves not whitened or sericeous beneath.
  Outer scales subulate-tipped, with a prominent carinate midnerve.
    Leaves narrowed at base, pubescent beneath. 12. *V. icosantha.*
    Leaves obtuse or rounded at base, strigose beneath. 13. *V. ventosa.*
  Outer scales lanceolate, acuminate, without a carinate nerve.
    Leaves acute or acuminate.
      Leaves 4 cm. long or more.
        Pappus tawny. 14. *V. borinquensis.*
        Pappus white. 15. *V. arborescens.*
      Leaves 2 cm. long or less. 16. *V. crassinervia.*
    Leaves obtuse, elliptic. 17. *V. membranacea.*

2. Leaves of a linear or linear-lanceolate type, less than 1 cm. wide. ARARIPENSES.

Leaves lanceolate, 3–5 mm. wide. 18. *V. araripensis.*
Leaves linear, 2 mm. wide. 19. *V. stenophylla.*

b. Heads densely crowded; leaves deeply rugose, densely hirsute with long hairs beneath. PERMOLLES.

Involucral scales pubescent below, glabrous at the top. 20. *V. permollis.*
Involucral scales pubescent throughout. 21. *V. intonsa.*

‡‡ Inner scales obtuse or rounded. DIVARICATAE.

Leaves attenuate at the base.
  Pappus rufescent; heads 11–13-flowered. 29. *V. divaricata.*
  Pappus white; heads 18-flowered. 30. *V. albicoma.*
Leaves rounded or obtuse at base. 31. *V. expansa.*

†† Cymes shortened, bearing 1–7 heads subtended by bracts approximating the foliage leaves in size and shape. LONGIFOLIAE.

Leaves lanceolate, acuminate. 32. *V. longifolia.*
Leaves oblong or oval, acute to emarginate.
  Leaves not more than twice as long as wide. 33. *V. albicaulis.*
  Leaves three times as long as wide. 34. *V. Sintenisii.*

*** Involucre 7–10 mm. high, its scales all appressed, closely and regularly imbricated in numerous series.

† West Indian species. FRUTICOSAE.

Leaves ovate or broadly oblong.

Involucre campanulate; leaves coriaceous, revolute.

22. *V. fruticosa.*
23. *V. leptoclada.*

Involucre cylindric; leaves flat. 24. *V. Sagraeana.*

Leaves narrowly oblong to oblong-linear.

Principal scales obtuse to subacute and mucronate.

Leaves scabrellate above, obtuse or rounded at the base. 25. *V. inaequiserrata.*

Leaves very scabrous above, narrowed from above the middle to a truncate base. 26. *V. Sprengeliana.*

Principal scales sharply acute or acuminate.

Leaves thin, pilose beneath; scales densely tomentose. 27. *V. viminalis.*

Leaves thick, nearly glabrous beneath; scales arachnoid-ciliate. 28. *V. Valenzuelana.*

†† Mexican species. SCHIEDEANAE.

Inner scales obtuse or rounded at the apex.

Inner scales constricted below a dilated tip 2–3 mm. wide. 35. *V. Schiedeana.*

Inner scales narrowed to a tip 1 mm. wide. 36. *V. Seemanniana.*

Inner scales sharply acuminate. 37. *V. vernicosa.*

II. SCORPIOIDEAE REDUCTAE

Leaves 5–9 cm. long, lepidote on both sides. 38. *V. lepidota.*

Leaves 3.5 cm. long or less.

Leaves broadest at or near the middle, not conspicuously attenuate at base.

Leaf-blades 5 mm. long. 39. *V. complicata.*

Leaf-blades 1–2 cm. long. 40. *V. arctata.*

Leaves broadest much above the middle, long-attenuate at base.

Leaves broadly obcordate. 41. *V. obcordata.*

Leaves spatulate. 42. *V. bahamensis.*

III. SCORPIOIDEAE AGGREGATAE

Leaves glabrous.

Scales in about 10 series; involucre 8 mm. high. 43. *V. buxifolia.*

Scales in about 6 series; involucre 5 mm. high. 44. *V. montana.*

Leaves pubescent at least beneath.

Leaves glabrous above. 45. *V. yunquensis.*

Leaves softly pubescent on both sides. 46. *V. Thomae.*

IV. SCORPIOIDEAE APHYLLAE

* West Indian species. HAVANENSES.

Lower heads with peduncles equaling or longer than the involucre; leaves remotely toothed. 47. *V. havanensis.*

Lower heads sessile; leaves sharply serrate. 48. *V. pallescens.*

** Mexican and Central American species.

Cymes straight or curved, little branched or not at all. SCORPIOIDES.
  Cymes straight; leaves gradually narrowed to an obtuse base.
    49. *V. brachiata.*
  Cymes curved; leaves abruptly narrowed at the base.
    50. *V. scorpioides.*
Cymes flexuous, freely branched and approaching a panicle in appearance. DEPPEANAE.
  Heads 11-flowered. 51. *V. Aschenborniana.*
  Heads 18–21-flowered.
    Leaves tomentose or floccose beneath. 52. *V. Deppeana.*
    Leaves pubescent or strigose beneath.
      Pappus tawny. 53. *V. patens.*
      Pappus white. 54. *V. canescens.*

V. PANICULATAE DICHOTOMAE

One species. 55. *V. menthaefolia.*

VI. PANICULATAE UMBELLIFORMES

Involucre 6 mm. high or more.
  Heads 18–21-flowered.
    Scales all subulate. 56. *V. corymbiformis.*
    Only the outer scales, or none, subulate.
      Inner scales lax, somewhat spreading at tip; leaves 3–5 times as long as broad. 57. *V. Karwinskiana.*
      Inner scales erect, not spreading; leaves 2–2.5 times as long as broad. 58. *V. jaliscana.*
  Heads 8–11-flowered.
    Leaves nearly glabrous above, 1 cm. wide or less.
      59. *V. umbellifera.*
    Leaves very scabrous above, 1.5 cm. wide or more.
      60. *V. serratuloides.*
Involucre 4–5 mm. high; heads 8–11-flowered.
  Leaves floccose-tomentose beneath. 61. *V. oaxacana.*
  Leaves scabrously pubescent on the veins beneath.
    62. *V. capreaefolia.*
  Leaves pubescent or puberulent beneath.
    Inner scales sharply acute or acuminate. 63. *V. liatroides.*
    Inner scales subacute or obtuse. 64. *V. Sinclairi.*

VII. PANICULATAE VERAE

* Heads very large, 1.5–2 cm. broad.

Scales oblong with parallel sides, cuspidate, the outer reflexed; leaves ovate to lanceolate. ALAMANIANAE.
  Leaves attenuate at base. 65. *V. Alamani.*
  Leaves rounded or obtuse at base. 66. *V. dictyophlebia.*
Scales acuminate or filiform at the tip; leaves linear to lanceolate. CRINITAE.

Leaves 3 mm. wide, revolute, lanate beneath. 71. *V. Bolleana.*
Leaves 5–20 mm. wide, flat, glabrous or nearly so.
72. *V. crinita.*

** Heads small or medium, 0.4–1.2 cm. broad, few- to many-flowered.

† Scales rounded to short-acuminate at the apex.

‡ Leaves of a linear type.

Leaves scabrous above.
Some or all of the leaves revolute and narrowly linear.
95. *V. angustifolia.*
Leaves not revolute, linear-lanceolate to narrowly oblong.
Scales arachnoid-ciliate. 96. *V. dissimilis.*
Scales glabrous or nearly so. 67. *V. texana.*
Leaves glabrous or nearly so above.
Scales strongly pubescent or tomentose on the back. LINDHEIMERIANAE.
Leaves revolute, densely white-woolly beneath.
73. *V. Lindheimeri.*
Leaves flat, not white-woolly beneath.
Involucre campanulate ; scales sparsely ciliate.
74. *V. guadalupensis.*
Involucre hemispheric ; scales densely arachnoid-ciliate.
75. *V. Reverchonii.*
Scales glabrous or ciliate.
Heads 8–13-flowered.
Leaves narrowly linear, 1–2 mm. wide. 78. *V. Lettermanni.*
Leaves 5 mm. wide or more.
Involucre 6–7 mm. high. 97. *V. concinna.*
Involucre 3–4 mm. high. 87. *V. gigantea.*
Heads 18–29-flowered.
Involucre very loosely and irregularly imbricated, 5 mm. high.
Leaves mostly basal, broadest above the middle.
98. *V. Blodgettii.*
Leaves scattered, broadest at or below the middle.
99. *V. insularis.*
Involucre closely and regularly imbricated.
Leaves entire ; scales acuminate. 77. *V. marginata.*
Leaves serrate or dentate ; scales obtuse or acute.
Involucre 8 mm. broad. 76. *V. tenuifolia.*
Involucre 5 mm. broad. 80. *V. fasciculata.*

‡‡ Leaves lanceolate to ovate.

Leaves glabrous, thinly pubescent or scabrous beneath.
Heads 8–13-flowered. 87. *V. gigantea.*
Heads 18–29-flowered.
Pappus purple.
Involucre 4–5 mm. high. 86. *V. altissima.*
Involucre 6–8 mm. high.

Leaves 4–7 cm. long, merely acute. 79. *V. corymbosa.*
Leaves 8–15 cm. long, acuminate. 80. *V. fasciculata.*
Pappus tawny or yellowish.
Involucre 3–4 mm. high ; scales rounded or subacute. 85. *V. flaccidifolia.*
Involucre 5–6 mm. high; scales short-acuminate or sharply acute.
Leaves 2–5 cm. wide ; southeastern United States. 84. *V. ovalifolia.*
Leaves 1–2.5 cm. wide ; Mexican. 68. *V. Ervendbergii.*
Heads 34–55-flowered.
Leaves broadly obovate-oblong or oval ; scales acute. 69. *V. Schaffneri.*
Leaves oblong-lanceolate ; scales acuminate. 70. *V. Greggii.*

Leaves tomentose beneath.
Scales acuminate, slightly spreading or revolute. 82. *V. interior.*
Scales acute to rounded, appressed.
Involucre campanulate to hemispheric, 6 mm. high ; scales relatively few ; pappus purple. 81. *V. illinoensis.*
Involucre campanulate to cylindric, 8 mm. high ; scales relatively numerous ; pappus tawny. 83. *V. missurica.*

†† Scales long-acuminate to filiform at the tip.

Heads with 26 flowers or more (see also no. 91, *V. acaulis*).
Pappus straw-colored. GLAUCAE. 88. *V. glauca.*
Pappus purple or tawny-purple. NOVEBORACENSES.
Heads 26–42-flowered ; scales ovate, abruptly tapering into the tip. 89. *V. noveboracensis.*
Heads with 55 flowers or more ; scales lanceolate, gradually tapering to the tip. 90. *V. Harperi.*
Heads with about 21 flowers. PULCHELLAE.
Leaves all or mostly basal. 91. *V. acaulis.*
Leaves scattered over the stem.
Leaves 3–4 times as long as broad, evidently serrate. 92. *V. pulchella.*
Leaves 5–16 times as long as broad, serrulate or entire.
Scales closely appressed at base, recurved at tip. 93. *V. recurva.*
Scales loosely appressed at base, not recurved. 94. *V. scaberrima.*

Section BACCHAROIDES Moench, Meth. 578, as genus. 1794

1. VERNONIA ANTHELMINTICA (L.) Willd. Sp. Pl. 3 : 1634. 1804

Conyza anthelmintica L. Sp. Pl. ed. 2. 1207. 1763.
Baccharoides anthelmintica Moench, Meth. 578. 1794.
Ascaricida indica Cass. Dict. Sci. Nat. 3 : Suppl. 38. 1816.

Type locality: " habitat in India."

Distribution: tropical Asia, introduced in Jamaica.

Section TEPHRODES DC. Prodr. 5: 24. 1836.

2. VERNONIA CINEREA (L.) Lessing, Linnaea 4: 291. 1829

Conyza cinerea L. Sp. Pl. 862. 1753.

Type locality: India.

Distribution: tropics of the Old World, and introduced in various portions of tropical America.

Section LEPIDAPLOA Cass. Dict. Sci. Nat. 26: 16, as genus. 1823

I. LEPIDAPLOA, *Scorpioideae foliatae*

Heads in scorpioid cymes, subtended by bracteal leaves.

(i) Species-group *Argyropappae*

Herbaceous, leaves acute or acuminate, pilose or pubescent beneath; inflorescence lax, of a few spreading cymes; involucre 6–10 mm. high, its scales all straight, loosely imbricated, acuminate or subulate, and more or less pubescent. North American species four, three in Mexico and Central America, and one in the West Indies; others doubtless occur in South America.

3. VERNONIA ARGYROPAPPA Buek, Index Prodr. 2: v. 1840

Vernonia Poeppigiana DC. Prodr. 5: 55. 1836. Not *V. Poeppigiana* DC. Prodr. 5: 20.

Vernonia geminiflora Poepp.; Poepp. & Endl. Nov. Gen. et Sp. 3: 42. 1845.

Apparently herbaceous, at least 1 m. high; stem striate, sparsely hirsute-pubescent with brown hairs; leaves thin, obovate-lanceolate, 8–12 cm. long, 2–3.5 cm. wide, acuminate, entire or minutely serrulate, gradually narrowed to the almost sessile base, rugose and papillate-pilose above, softly hirsute beneath; upper leaves similar but smaller; inflorescence sparingly branched, of several divaricately spreading cymes bearing each 4–10 heads; bracteal leaves oblong to oblong-lanceolate, otherwise like the cauline, the lowest 4 cm. long, 1.2 cm. wide, the upper smaller; heads about 21-flowered, 2–3 cm. apart; involucre broadly obconic or nearly hemispheric, 8–10 mm. high; scales subulate or the inner narrowly linear, erect, pilose; pappus white, 8 mm. long; achenes 3 mm. long, hirsute.

Type locality: Peru.

Distribution: Vera Cruz to Costa Rica and probably southward into South America.

The identity of the Peruvian type and the Mexican species is accepted on the authority of Hemsley (Biol. Cent. Am. Bot. 2: 73).

4. Vernonia acilepis Benth. Vidensk. Meddel. 1852: 68. 1852

Herbaceous, erect, 3–4 dm. high; stem thinly pubescent: leaves thin, broadly elliptic or rhombic, 4–6 cm. long, 1.5–2.5 cm. wide, short-acuminate, entire, narrowed at the base into short margined petioles, scabrellate above, sparsely pilose or nearly glabrous beneath; inflorescence of 3–5 lax spreading cymes bearing each 4–8 heads; bracteal leaves oblong to oblanceolate, 2–3 cm. long; heads about 15-flowered (*fide* Bentham), 2–3 cm. distant; involucre narrowly campanulate, 8 mm. high; scales all erect, lanceolate, subulate-tipped, scarious-margined, arachnoid below, puberulent above; achenes not seen; pappus brown.

Type locality and distribution: Costa Rica, *Tonduz 13595*.

5. Vernonia remotiflora Rich. Act. Soc. Hist. Nat. Paris 1: 112. 1792

Vernonia sessiliflora Willd. Linnaea 4: 309. 1829.
Vernonia tricholepis DC. Prodr. 5: 54. 1836.

Herbaceous, 3 dm. high; stem puberulent, prolonged into a single terminal cyme; leaves obovate-lanceolate, 3 cm. long, 1 cm. wide, acuminate, subentire, attenuate to a sessile base, pilose-hispid on both sides, especially beneath; upper leaves reduced and with heads in their axils; involucre campanulate, 8 mm. high; scales erect or appressed, lanceolate, sharply subulate-tipped, sparsely pilose; achenes densely pilose, 2 mm. long; pappus white, the outer series conspicuous.

Type locality: Cayenne.

Distribution: St. Thomas, *Oersted*, to South America.

Very close to *V. acilepis* Benth., but differing in the pubescence of the leaves.

6. **Vernonia hirsutivena** sp. nov.

Apparently herbaceous; stem finely striate, appressed-pubescent; leaves thin, ovate-lanceolate, 7–9 cm. long, 3–4 cm. wide, or the upper smaller, acute or short-acuminate, entire, obtuse or subrotund at base, scabrellate above, thinly and softly pubescent beneath; petioles 3 mm. long; inflorescence small, of a few sparingly branched cymes from the upper axils, which are leafless or with bracts at the branches; heads all sessile, about 21-flowered; involucre nearly hemispheric, 6–7 mm. high; scales pubescent, loosely and irregularly imbricated, the tips erect or somewhat spreading,

lanceolate, the outer subulate tipped, the inner short acuminate; immature achenes hirsute; pappus white, the scales of the outer series broad, conspicuous.

Type: *Gaumer 1325*, from Yot Tzonot, Yucatan; in the herbarium of the New York Botanical Garden.

Related to *V. argyropappa*, but differing in the shape and pubescence of the leaves and the shorter, densely pubescent scales.

(ii) Species-group *Pineticolae*

Heads few, sessile in the axils of the leaves; involucre large, its scales all subulate, erect or somewhat spreading; leaves bullate above, densely tomentose beneath. One species of eastern Cuba.

7. **Vernonia pineticola** sp. nov.

Growing in clumps, several stems from a common base, 2–4 dm. high; stem softly and densely pubescent; leaves spreading or somewhat reflexed, firm, ovate or broadly ovate-oblong, 3–4 cm. long, 1.5–2 cm. wide, obtuse or subacute, entire, rounded at the sessile base, glabrous and very rugose or bullate above, with deeply impressed veins, prominently veined and densely white-tomentose beneath; bracteal leaves similar, but little reduced; heads solitary in the axils of the upper leaves, forming a leafy cyme; involucre broadly campanulate, 8–10 mm. high; scales all loose, erect or somewhat spreading, subulate, pilose near the base, glabrate toward the apex; achenes 2 mm. long, densely hirsute-pubescent; pappus nearly white, 6 mm. long, the outer series 1.5 mm. long.

Type: *Underwood & Earle 1341*, from pine woods, Baracoa, Cuba; in the herbarium of the New York Botanical Garden.

(iii) Species-group *Arborescentes*

Heads sessile in loose spreading or curved leafy cymes, 11–21-flowered; involucral scales acute or acuminate, very loosely and irregularly imbricated in few series; achenes hirsute; pappus white or brown; leaves mainly of an ovate type, pubescent or tomentose, at least beneath. Ten North American species.

8. **Vernonia phyllostachya** (Cass.) nom. nov.

Lepidaploa phyllostachya Cass. Dict. Sci. Nat. **26**: 16. 1823.
Vernonia arborescens DC. Prodr. **5**: 48, in part. 1836.
Vernonia Berteriana DC. Prodr. **5**: 52. 1836.
Vernonia racemosa Delponte, Mem. Accad. Torino II. **14**: 396. 1854.

Vernonia arborescens Lessingiana Griseb. Fl. Brit. W. Ind. 353. 1861.

Suffrutescent, 6–8 dm. high; stems closely appressed-pubescent; leaves oblong-lanceolate to ovate-lanceolate, 5–7 cm. long, 1.5–2.5 cm. wide, acute, entire, obtuse or rounded at the base, sericeous beneath with appressed hairs; bracteal leaves ovate to oblong, equaling or the lower much exceeding the involucre; scales glabrous or nearly so; pappus brown.

Type locality: Porto Rico.

Distribution: Porto Rico, Hispaniola, and St. Thomas.

9. **Vernonia venusta** sp. nov.

Shrubby; stems finely striate, closely appressed-pubescent; leaves deep-green, thin, ovate-oblong, 4–6 cm. long, 1.8–2.8 cm. wide, obtuse or subacute, entire, broadly rounded or subcordate at base, softly pubescent above, villous or subtomentose with white hairs beneath; petioles 1–3 mm. long; cymes numerous, terminal and from the upper axils, divaricately spreading or ascending, 8–16 cm. long, frequently branched; bracteal leaves ovate, sessile or nearly so, 1–2 cm. long, 0.6–1 cm. wide, much exceeding the involucre; heads sessile, 1–1.5 cm. apart, 13-flowered; involucre rather narrowly campanulate, 5 mm. high; scales loosely and irregularly imbricated, all lanceolate or lance-oblong, sharply acuminate, glabrous or the outer with scattered hairs; achenes densely pubescent; pappus white, 5 mm. long.

Type: *Heller 6136*, from near Ponce, Porto Rico; in the herbarium of the New York Botanical Garden.

10. **Vernonia sublanata** sp. nov.

Shrubby; stem slender, striate, thinly pubescent; leaves broadly elliptic or oblong-obovate, 3–3.5 cm. long, 1.2–1.8 cm. wide, acute or obtuse, entire or undulate, narrowed to an obtuse base, rugose and scabrous-pubescent above, closely gray-tomentose beneath; petioles 3–4 mm. long; inflorescence divaricately branched; cymes lax, 5–15 cm. long; bracteal leaves oblong, the upper equaling the involucre, the lower twice as long; heads sessile, 1–2 cm. apart, about 21-flowered; involucre hemispheric, its longest scales 7 mm. long; scales lance-oblong, acuminate, pubescent, green with a scarious margin; achenes densely pubescent, 3 mm. long; pappus pale-tawny, 5 mm. long, the outer series white, conspicuous.

Type: *Britton, Britton & Shafer 784* from Madruga, Cuba; in the herbarium of the New York Botanical Garden.

Vernonia sublanata angustata var. nov.

Resembling the type, but with leaves narrowly oblong, 4 cm. long, 6 mm. wide, obtuse and mucronulate at the tip.

Type: *Underwood & Earle 202*, from Santiago, Cuba; in the herbarium of the New York Botanical Garden.

11. Vernonia gnaphaliifolia Rich. in Sagra, Hist. Fis. Pol. Nat. Cuba **11**: 34. 1850

Vernonia arborescens Griseb. Cat. Pl. Cuba 144. 1866. Not *V. arborescens* Sw.

Vernonia Wrightii Griseb *l. c.* Not *V. Wrightii* Sch.-Bip.

Stems incanous; leaves ovate-lanceolate, obtuse or subacute, entire, rounded or attenuate at base, strongly rugose or bullate and scabrellate above, densely tomentose beneath; bracteal leaves resembling the cauline, much exceeding the heads; scales lanceolate, acuminate, pubescent; achenes hirsute.

Type locality: "prope Canasi," Cuba.

Distribution: Cuba, *Wright 1309*, in part.

Wright's collection, *1309*, included two species, one a form with broad, smooth leaves, *V. Sagraeana* DC., and the other with tomentose leaves. The first was taken by Schultz as the type of his *V. Wrightii*. Grisebach, apparently considering that the number included but one species, published the name for the second form, thus introducing the synonyms cited above.

12. Vernonia icosantha DC. Prodr. **5**: 49. 1836

Vernonia divaricata Lessing, Linnaea **4**: 306. 1829. Not *V. divaricata* Sw.

Shrubby, branching above; stem finely striate, closely appressed-pubescent; leaves oblong or oblong-lanceolate, 5–7 cm. long, 1.2–2 cm. wide, acute or short-acuminate, entire, narrowed below to an obtuse base, sparsely short-pubescent above, pubescent and with elevated veins beneath; cymes many, terminal and in the upper axils, 6–8 cm. long; bracteal leaves shorter than the involucre, oblong; heads sessile, 1–2 cm. apart, 21-flowered; involucre broadly campanulate to hemispheric, 5 mm. high; scales loosely imbricated, erect or a little spreading, sparsely pubescent, the outer linear-lanceolate, subulate, the inner oblong-lanceolate, acuminate; achenes (immature) pubescent; pappus white, 5 mm. long, the outer series conspicuous, 1 mm. long.

Type locality: "in Martinica."

Distribution: Martinique.

The description above is based on two sheets of *Sieber 190* from Martinique. This is in all probability duplicate material of the specimens upon which Lessing's *divaricata* was based.

13. Vernonia ventosa sp. nov.

Vernonia arborescens divaricata Griseb. Fl. Brit. W. Ind. 353, in part. 1861.

Suffrutescent or shrubby, 14–30 dm. tall, branching above; stems striate, softly pubescent; cauline leaves bright-green, thin, ovate-lanceolate, 7–10 cm. long, 2–4 cm. wide, tapering to an acute tip or subacuminate, entire, rounded or broadly obtuse at base, very sparsely strigose-pubescent on both sides; petioles 2–4 mm. long; axile leaves similar; inflorescence loose, of 3–many divaricately spreading, straight or curved, sparingly branched cymes 1–2 dm. long; bracteal leaves lanceolate, long-acuminate, the lower up to 4.5 cm. long and 1.3 cm. wide, the uppermost barely exceeding the involucre; heads 1–1.5 cm. apart, sessile, about 21-flowered; involucre broadly campanulate, 5–6 mm. high; scales loosely and irregularly imbricated, erect or a little spreading, all acuminate, the outer pubescent towards the base and subulate with a carinate midnerve, the inner lanceolate; achenes pubescent, 2 mm. long; pappus white, 5 mm. long, the outer series distinct.

Type: *Duss 303, 304, 4069* from Martinique; in the herbarium of the New York Botanical Garden.

Distribution: Martinique, St. Vincent, Guadeloupe.

14. Vernonia borinquensis Urban, Symb. Ant. 3: 390. 1903

Shrubby, 5–30 dm. high, branching above; stem striate, slender, glabrous or nearly so; leaves spreading or somewhat reflexed, firm, ovate to oblong-lanceolate, 4–6 cm. long, 1.5–2 cm. wide, acuminate, entire, somewhat revolute, rounded or obtuse at the base, rugose and scabrous above, pubescent beneath with subappressed hairs, but not sericeous; petioles 2–5 mm. long; axile leaves similar but smaller; inflorescence lax, of numerous spreading, branching, flexuous cymes up to 15 cm. long, the axes more or less pubescent; bracteal leaves resembling the cauline in shape, the lower 2.5–3.5 cm. long, the upper equaling or exceeding the involucre; heads sessile, 1–2 cm. apart, about 18-flowered; involucre 6 mm. high, turbinate-campanulate; scales loosely imbricated, the outer somewhat spreading, lanceolate, acuminate, glabrous or nearly so; achenes 1.5–2 mm. long, densely pubescent; pappus tawny, 5 mm. long.

Type locality and distribution: Porto Rico.

Specimens of the variety *Stahlii* Urban (*l. c.* 391) have not been seen.

15. VERNONIA ARBORESCENS (L.) Sw. Fl. Ind. Occ. 3: 1320. 1806

Conyza arborescens L. Syst. Nat. ed. 10. 2: 1213. 1759.

Leaves thin, ovate or ovate-lanceolate, subacute to acuminate, sparsely pubescent above, densely so beneath and with elevated reticulated veins; outer scales acuminate, the inner acute or abruptly acuminate; pappus white.

Type locality and distribution: Jamaica.

16. **Vernonia crassinervia** Wright *ined.* sp. nov.

Shrubby; stems striate, puberulent or pubescent, with short internodes, simple or with a few branches; leaves firm, elliptic-oblong, 1.5–2 cm. long, 0.5–1 cm. wide, entire, tapering regularly from the middle to both ends, rugose and scabrellate above, pubescent and with a few prominent veins beneath; cymes 1–3, 1 dm. long or shorter, bearing 2–6 sessile heads, of about 13 flowers; bracteal leaves narrowly oblong, equaling or exceeding the involucre; scales all erect, loosely and irregularly imbricated in few series, lanceolate, sparsely pubescent, scarious on the margins, sharply acuminate; achenes densely hirsute, 2 mm. long; pappus white or brownish, 6 mm. long, the outer series of conspicuous oblong scales.

Type: *Wright 2787*, from Cuba; in the Gray Herbarium; *Combs 745* is identical with it. The species is distinct from all other West Indian species in its short elliptic leaves.

17. VERNONIA MEMBRANACEA Griseb. Cat. Pl. Cuba 144. 1866

Suffrutescent; stem finely pubescent, branching above; leaves thin, spreading, broadly elliptic or ovate-oblong, 5–8 cm. long, 2.5–4 cm. wide, obtuse, entire, obtuse at the base, sparsely pubescent on both sides; petioles 3–5 mm. long; heads in short spreading cymes, subtended by bracteal leaves 1–3 cm. long; involucre campanulate, 6 mm. high; scales lanceolate, acuminate, thinly pubescent; pappus brown.

Type locality and distribution: Cuba.

In shape of leaf and general habit the species greatly resembles *V. albicaulis* Pers.

(iv) Species-group *Araripenses*

Heads in leafy cymes, the involucral scales acuminate or subulate; achenes hirsute; leaves linear to lanceolate or narrowly oblong, several times longer than wide, pubescent beneath. Species of the West Indies and northern South America.

18. VERNONIA ARARIPENSIS Gardn. Lond. Jour. Bot. 5: 222. 1846

Vernonia tricholepis Griseb. Fl. Brit. W. Ind. 354. 1861. Not *V. tricholepis* DC.

Herbaceous or suffrutescent, 5–10 dm. high; stems puberulent; leaves narrowly lanceolate, 4–5 cm. long, 3–5 mm. wide, long-acuminate, subentire, revolute, rugose and scabrellate above, cinereous-pubescent beneath; cymes spreading, 6–15 cm. long; lower bracteal leaves resembling the cauline, the upper much reduced; involucre 5–6 mm. high, its scales very loosely and irregularly imbricated, lanceolate, sharply acuminate, sparsely pubescent; achenes hirsute; pappus yellowish-white, the outer series prominent.

Type locality: Serra de Araripe, Province of Ceara, Brazil.

Distribution: Hispaniola and Jamaica to Brazil, *Wright 286*, *Wright*, *Parry & Brummel 270*.

19. VERNONIA STENOPHYLLA Lessing, Linnaea 6: 667. 1831

Herbaceous, erect, 4–5 dm. high; stem pubescent; leaves linear or oblong-linear, 4 cm. long, 2 mm. wide, sparsely pubescent above, canescent beneath, entire, obtuse and mucronulate; heads in spreading terminal cymes; bracteal leaves resembling the cauline, much exceeding the heads; involucre 6–7 mm. high, its scales very irregularly imbricated, lanceolate, pubescent, acuminate into subulate tips; achenes hirsute; pappus nearly white.

Type locality: San Domingo.

Distribution: Cuba and Hispaniola.

The single specimen examined, *Wright 2786*, from Cuba, does not agree in every particular with Lessing's original description, but the differences do not appear sufficient to warrant its separation.

(v) Species-group *Permolles*

Heads numerous, crowded in dense curved cymes, subtended by bracts equaling or shorter than the involucre; leaves strongly rugose above, densely and softly hirsute with long hairs beneath. Two species of Jamaica.

20. **Vernonia permollis** sp. nov.

Vernonia rigida DC. Prodr. 5: 49. 1836. Not *V. rigida* Sw.

Shrubby, branching; stem nearly terete, coarsely tomentose-pubescent; leaves firm, broadly ovate, 6–9 cm. long, 3–5 cm. wide, acute or abruptly short-acuminate, entire, broadly rounded or subcordate at base, rugose above and finely scabrous-pubescent, veins

impressed, pubescent, softly villous beneath with gray or brown hairs, which are most dense along the secondary veins; petioles tomentose, 5–7 mm. long; upper and axile leaves similar but smaller; inflorescence hemispheric or pyramidal; cymes short, crowded, irregularly branching, bearing few heads; bracteal leaves much shorter than the involucre or occasionally wanting; heads sessile, crowded, 11-flowered; involucre campanulate, 4–5 mm. high; scales loosely and irregularly imbricated, the outer lanceolate, acuminate, sparsely pubescent, the inner oblong-lanceolate, acute, the exposed portion glabrous or with a tuft of hairs near the tip; immature achenes densely pubescent; pappus white, 5 mm. long.

Jamaica, *Shreve* (type), and *Maxon 895;* both in the herbarium of the New York Botanical Garden.

21. **Vernonia intonsa** sp. nov.

Shrubby; stems terete, densely tomentose, becoming glabrate with age, freely branching above; rameal leaves thick, ovate-oblong, 2–3 cm. long, 1–1.3 cm. wide, obtuse or subacute, entire, rounded at base, very rugose and under the lens apparently scabrous above, minutely pubescent on the impressed veins, densely villous beneath with gray hairs; petioles 2–3 mm. long; inflorescence a pyramidal cluster of several short compact aggregated cymes, the axes tomentose; bracteal leaves tomentose, equaling or shorter than the heads; heads 4–8 on each cyme, sessile, crowded, 11–13-flowered; involucre campanulate, 4 mm. high; scales irregularly imbricated in a few series, erect, pubescent throughout, the outer triangular-lanceolate, acuminate, the inner oblong-lanceolate, acute; achenes (immature) densely pubescent; pappus white, the outer series distinct.

Type: *Campbell 6091*, from Jamaica; in the herbarium of the New York Botanical Garden.

(vi) Species-group *Fruticosae*

Leaves thick or coriaceous, mostly glabrous and shining above, and frequently revolute; heads large, subtended by bracts approximating the cauline leaves in size and shape; involucre 7–10 mm. high, narrowly campanulate, closely imbricated; achenes usually glabrous. Seven species, of Jamaica, Cuba and Hispaniola.

22. Vernonia fruticosa (L.) Sw. Fl. Ind. Occ. 3: 1323. 1806

Conyza fruticosa L. Sp. Pl. ed. 2. 1209. 1763.
Vernonia rigida Sw. Fl. Ind. Occ. 3: 1322. 1806.

Authentic specimens of this species have not been seen. It is closely related to *V. leptoclada*, but was regarded as distinct by Schultz, and also by Dr. Britton, who examined Jamaican specimens at the Kew Herbarium. Schultz defines it in the following

words: " *Vernonia rigida*, Sw!, cujus specimen auctoris in herbario Schreberiano vidi, planta rigidissima, ab omnibus differt ramis flexuosis, involucro turbinato, imbricatissimo, ½ poll. longo, cum pedunculo brevi pariter squamis obsito obtusis." (Jour. Bot. 1: 233.)

23. VERNONIA LEPTOCLADA Sch.-Bip. Jour. Bot. 1: 233. 1863

Shrubby, branching above, the stems thinly cinereous; leaves rigid, coriaceous, broadly elliptic or oblong, 4–8 cm. long, 2–3 cm. wide, acute, entire or with a few scattered teeth, revolute, rounded at the base, glabrous and very rugose above, puberulent on the veins beneath; heads in long curving cymes; bracts resembling the foliage leaves, the largest 4 cm. long; involucre campanulate, its scales oblong to oblong-lanceolate, pubescent, the outer acute and cuspidate, the inner obtuse.

Type locality and distribution: Cuba, *Wright 284*, in part.

24. VERNONIA SAGRAEANA DC. Prodr. 5: 55. 1836

Vernonia Wrightii Sch.-Bip. Jour. Bot. 1: 234. 1863.

Shrubby, branching above; stems cinereous or becoming glabrous; leaves firm, elliptic to ovate-oblong, 8–10 cm. long, 3–4 cm. wide, acute, sharply denticulate or nearly entire, glabrous on both sides except for some sparse pubescence on the veins; heads in long terminal cymes subtended by bracts resembling the foliage leaves in size and shape; scales closely imbricated, pubescent, the outer triangular-lanceolate, acuminate, the inner oblong, acute; achenes glabrous; pappus sordid-purple.

Type locality and distribution: Cuba, *Wright 284*, in part.

25. VERNONIA INAEQUISERRATA Sch.-Bip. Jour. Bot. 1: 232. 1863

Vernonia inaequiserrata obtusifolia Griseb. Cat. Pl. Cuba 144. 1866.

Vernonia inaequiserrata augustifolia Griseb. *l. c.*

Vernonia rubricaulis Griseb. Mem. Am. Acad. II. 8: 511. 1862. Not *V. rubricaulis* Humbl. & Bonpl.

Stem apparently herbaceous, thinly cinereous-tomentose; leaves firm, narrowly oblong to elliptic-oblong, 6–9 cm. long, 1–2.5 cm. wide, acute or short-acuminate, narrowed or subobtuse at base, irregularly serrate to subentire, rugose and nearly glabrous above, prominently reticulated and cinereous-tomentose beneath; heads in spreading terminal cymes with bracteal leaves about equaling the involucre, or in the axils of the upper foliage leaves; involucre

campanulate-cylindric, 8 mm. high; scales closely imbricated, appressed, thinly arachnoid, ovate to ovate-lanceolate, the inner obtuse or rounded and mucronulate; achenes glabrous, 3.5 mm. long; pappus sordid-purple or tawny.

Type locality and distribution: Cuba.

Schultz's species is based on *Wright 285*. This number, however, includes at least one other species.

26. Vernonia Sprengeliana Sch.-Bip. Jour. Bot. 1: 232. 1863

Stem erect, cinereous-pubescent; leaves crowded, ascending, narrowly oblanceolate, 7–10 cm. long, 1.2–1.8 cm. wide, very rugose and scabrous above, densely tomentose beneath, gradually attenuate from above the middle to a truncate base; heads in short crowded terminal cymes; involucre 10 mm. high, narrowly campanulate; scales all narrowly oblong, the outer acute, the middle and inner rounded and minutely apiculate, all thinly pubescent with scattered hairs.

Type locality and distribution: San Domingo, *Wright*, *Parry & Brummel 273*.

27. **Vernonia viminalis** sp. nov.

Apparently suffrutescent; stem terete, finely striate, cinereous or tomentose, divaricately branching above; leaves thin, ascending, narrowly oblong or elliptic-oblong, 8–14 cm. long, 1–3 cm. wide, somewhat falcate or asymmetrical, long-acuminate, entire or minutely denticulate, attenuate at base, rugose and scabrellate above, pilose with soft white hairs beneath, reticulately veined; petioles none or very short; cymes numerous, 2–3 dm. long, flexuous; bracteal leaves resembling the cauline, 2–5 cm. long; heads about 29-flowered, sessile, 1.5–3 cm. apart; involucre campanulate, 9–10 mm. high; scales appressed, closely imbricated in many series, the outer ovate-lanceolate, the inner narrowly oblong, all acuminate and sharply cuspidate, the basal portion densely tomentose-ciliate; achenes glabrous, sharply angled, 3.5 mm. long; pappus yellowish-white, 8 mm. long, the outer series minute.

Type: *Wright 285*, from Cuba; in the herbarium of Columbia University.

28. Vernonia Valenzuelana Rich. in Sagra, Hist. Fis. Pol. Nat. Cuba 11: 33. 1850

Vernonia rigida Valenzuelana Griseb. Cat. Pl. Cuba 144. 1866.

Stems woody, thinly pubescent; leaves rigid, coriaceous, narrowly oblong or linear-oblong, 8–10 cm. long, 0.8–1.7 cm. wide, acute, entire or remotely denticulate, revolute, truncate or rounded or sub-

cordate at base, rugose but glabrous and shining above, puberulent and prominently reticulate beneath; heads in long cymes; bracteal leaves resembling the cauline, 3–5 cm. long; involucre campanulate-cylindric, 8–9 mm. high; scales all appressed, arachnoid-ciliate, tapering to a cuspidate tip.

Type locality and distribution: Cuba, *Wright 2785*.

(vii) Species-group *Divaricatae*

Heads in leafy cymes, 11–18-flowered; scales obtuse or subacute; leaves thinly pubescent or nearly glabrous. Three species, all Jamaican.

29. Vernonia divaricata Sw. Fl. Ind. Occ. 3: 1319. 1806

Vernonia acuminata Lessing, Linnaea 6: 663. 1831.

A straggling shrub, 1.3–1.6 m. high, with slender, striate, pubescent, branching stems; leaves thin, bright-green, elliptic, 5–6 cm. long, 1.3–1.8 cm. wide, long-acuminate, entire, narrowed at the base, sparsely and minutely pubescent on both sides, paler green beneath; inflorescence of numerous lax, divaricately spreading, many headed cymes; lower bracteal leaves approximating the cauline in size and shape, the uppermost 1–2 cm. long; heads sessile, distant, 11-flowered; involucre campanulate, 4–5 mm. high; scales appressed, irregularly imbricated, nearly glabrous, the outer ovate-lanceolate, acute, the inner oblong, tapering to an obtuse or subacute tip; achenes densely pubescent, 2 mm. long; pappus rufescent, 4–5 mm. long.

Type locality and distribution: Jamaica.

Lessing's *V. acuminata* is described with aggregated heads, resembling *Nichols 20* and *120*, a character possibly due merely to habitat, since the latter grew at an altitude of 5,000–7,400 feet.

30. **Vernonia albicoma** sp. nov.

Stem woody, striate, glabrous or puberulent, slender; leaves thin, bright-green, elliptic or elliptic-lanceolate, 5–6 cm. long, 1.5–2.3 cm. wide, acuminate, subentire, tapering at the base, glabrous to the touch above, but finely pubescent under the lens, very finely pubescent or glabrous beneath; petioles 5–7 mm. long; upper leaves somewhat reduced; inflorescence of 1–3 curved spreading terminal cymes bearing each 5–10 sessile 18-flowered heads; bracteal leaves lance-oblong, the middle ones about equaling the involucre, which is broadly campanulate or hemispheric, 5 mm. high; scales erect, loosely and irregularly imbricated, nearly glabrous, the outer lanceolate, acuminate; the inner oblong, acute; achenes densely pubescent; pappus white.

Type: *Campbell 6152*, from Jamaica; in the herbarium of the New York Botanical Garden.

31. Vernonia expansa sp. nov.

A straggling shrub 2.5–3 m. high, branching above; stems slender, striate, puberulent; leaves numerous, rather crowded, thin, divaricate, ovate, 3–5 cm. long, 1.7–2.7 cm. wide, acute or subacuminate, entire, obtuse or broadly rounded at base, sparsely and finely pubescent, or nearly glabrous above, the veins elevated on the upper side; petioles 3 mm. long; upper and axile leaves smaller, broadly elliptic, obtuse; inflorescence of several short cymes terminating the branches and in the upper axils, bearing each 3–6 heads; bracteal leaves equaling or much shorter than the involucre; heads crowded, sessile, 11-flowered; involucre broadly campanulate, 4 mm. high; scales all appressed, closely imbricated, glabrous or nearly so, the outer broadly ovate, the inner lance-oblong, all rounded at the tip; achenes 2 mm. long, densely gray-pubescent; pappus brown.

Type: *Harris 8796*, from Jamaica, altitude 2,000 feet; in the herbarium of the New York Botanical Garden.

(viii) Species-group *Longifoliae*

Heads sessile, crowded in short divaricate cymes bearing each 1–7 heads, subtended by bracts resembling the cauline leaves in size and shape; leaves various in shape, thinly pubescent. Three species, extending from the Windward Islands to Hispaniola.

32. Vernonia longifolia Pers. Syn. 2: 404. 1807

Vernonia punctata Sw. Kgl. Vet. Acad. Stockh. Handl. **1827**: 72. 1828.

Leaves elliptic to elliptic-lanceolate, 6–11 cm. long, 2–4 cm. wide, acuminate or rarely acute.

Type locality: Guadeloupe.

Distribution: Guadeloupe, St. Kitts, Martinique, Dominica.

33. Vernonia albicaulis Pers. Syn. 2: 404. 1807

Eupatorium obtusifolium Willd. Sp. Pl. 3: 1768. 1804.

Conyza glabra Willd. *l. c.* 1940.

Vernonia emarginata Wikstr. Kgl. Vet. Acad. Stockh. Handl. **1827**: 73. 1828.

Vernonia Vahliana Lessing, Linnaea **4**: 306. 1829.

Vernonia longifolia Vahliana Urban, Symb. Ant. **1**: 456. 1900.

Leaves broadly obovate-elliptic, 2.5–6 cm. long, 1.5–3.5 cm. wide, obtuse or emarginate, rarely subacute.

Type locality: St. Croix.

Distribution: Hispaniola, Porto Rico and St. Croix.

34. **Vernonia Sintenisii** (Urban) sp. nov.

Vernonia longifolia Sintenisii Urban, Symb. Ant. 1: 456. 1900.

Shrubby, 2 m. high; mature stems glabrate or thinly tomentose, young shoots and inflorescence closely tomentose; leaves firm, somewhat crowded, oblong, 2–4 cm. long, 0.6–1.3 cm. wide, acute or rounded at the tip, tapering to an acute or obtuse base, entire or somewhat revolute, pubescent beneath, sparsely pubescent and more or less resinous-dotted above; petioles 2 mm. long; bracteal leaves broadly oblong, rounded at base and apex, not over 1 cm. long or 0.7 cm. wide; inflorescence corymbiform, composed of a few short aggregated cymes bearing each 1–3 sessile heads; involucre broadly campanulate, loosely and irregularly imbricated, 4–5 mm. high; scales erect, oblong-lanceolate, acuminate, pubescent; achenes 2.5 mm. long, densely pubescent; pappus tawny or pale brown, 4 mm. long, the outer series conspicuous.

Type locality: Porto Rico.

Distribution: Porto Rico, *Sintenis 3727, 4721.*

(ix) Species-group *Schiedeanae*

Heads large, many flowered; involucres broad, 8–10 mm. high, the scales very many, closely imbricated in many series; leaves oblong-lanceolate, thick or coriaceous, generally shining above. At least two, and probably the third also, are climbing woody vines. Three species, from Mexico south to Panama.

35. Vernonia Schiedeana Lessing, Linnaea 6: 399. 1831

Shrubby, climbing, 1–3 m. high; leaves oblong-lanceolate, coriaceous, 10–15 cm. long; scales of the involucre ciliate, somewhat constricted near the tip and then dilated into a flat, broadly rounded or emarginate, scarious, spreading tip 2–3 mm. wide.

Type locality: "in dumetis Papantlae et Misantlae," Mexico.

Distribution: from Vera Cruz south to Honduras.

36. Vernonia Seemanniana Steetz, in Seem. Bot. Voy. Herald 139. 1854

Climbing shrub; stems striate, pubescent; leaves subcoriaceous, ovate-lanceolate to oblong-lanceolate, 8–10 cm. long, 2.5–4 cm. wide, sharply acuminate, entire and frequently somewhat revolute,

rounded or obtuse at the base, glabrous and shining but rugose above, minutely puberulent below, with prominent reticulated veins; inflorescence of numerous spreading cymes 1–2 dm. long; heads sessile, 1–1.5 cm. distant; involucre broadly campanulate, 8 mm. high; scales closely imbricated, the outer triangular-lanceolate, ciliate and puberulent, with a prominent midvein, the inner lanceolate, tapering to a flat, obtuse, spreading tip 1 mm. wide; achenes 2 mm. long, hirsute with erect white hairs; pappus nearly white, 5 mm. long, the outer series very distinct.

Type locality: "Volcano of Chiriqui, Veraguas."

Distribution: Costa Rica, *Pittier 3706, 3727, 4931, 6887*, south to Panama.

In general habit and foliage much like *V. Schiedeana*, but with more pubescent involucre and differently shaped scales.

37. Vernonia vernicosa Klatt, Bull. Soc. Roy. Bot. Belg. **35**: 294. 1896

Shrubby, erect (? or climbing); stems striate, glabrous; leaves oblong-lanceolate, 8–10 cm. long, 2.5 cm. wide, coriaceous, acuminate, entire, rounded at the base, pinnately veined, glabrous on both sides; petioles 3–4 mm. long; upper leaves somewhat reduced; inflorescence loose, the cymes few, flexuous; bracteal leaves oblong, puberulent beneath, the largest 3 cm. long, 1 cm. wide; many heads not bracteate; heads nearly sessile, distant, 50-flowered, *fide* Klatt; involucre campanulate-cylindric, 10 mm, high; outer scales lanceolate, the intermediate ovate-lanceolate, the inner oblong, in many series, regularly imbricated, erect or barely spreading, glabrous, green, scarious-margined, acuminate; achenes (immature) densely hirsute; pappus white, 7 mm. long, the outer series large, distinct.

Type locality: Rio Varilla, Costa Rica.

Distribution: Costa Rica, *Pittier 9860, 7013, 7065, Hoffmann 305*.

Vernonia vernicosa comosa Greenman, Proc. Am. Acad. **39**: 93. 1903

Resembling the type, but with pubescent stem and strigose-hirsute leaves.

Type locality and distribution: Costa Rica, *Tonduz 13607*.

II. Lepidaploa, *Scorpioideae reductae*

§ *Leptospermoides* DC. Prodr. **5**: 17. 1836.

Heads in reduced scorpioid cymes, the individual cymes with few heads or frequently but one, in which case they appear solitary

and scattered among the upper foliage leaves. West Indian shrubs, with freely branched stems and mostly obtuse or rounded leaves.

38. Vernonia lepidota Griseb. Cat. Pl. Cuba 145. 1866

Suffrutescent or frutescent, ascending, 3 m. high; stems and branches closely brown-tomentose; leaves oblong or obovate-oblong, 5–9 cm. long, 2–4 cm. wide, obtuse or rounded at the apex, entire, narrowed below into short petioles, green and lepidote above, brown and densely lepidote, with prominent veins, beneath; inflorescence of subcapitate clusters; heads short-peduncled, about 21-flowered; involucre broadly campanulate, 5–6 mm. high; scales closely imbricated in few series, all acute or subacute and pubescent, the inner oblong, the outer triangular-lanceolate; "achenes smooth; pappus white."

Type locality: "Cuba or., pr. Baracoa, in vertice montis Yunque."

Distribution: Cuba.

The type specimen has apparently immature heads on strongly angled connivent peduncles 1 cm. long, subtended by short oblong bracts.

39. Vernonia complicata Griseb. Cat. Pl. Cuba 143. 1866

A densely branched shrub, 5 dm. high; stem nearly terete, leafy, closely and softly tomentose; leaves thick, rotund or very broadly obovate, 5–6 mm. long and wide, entire, tomentose on both sides, complicate, abruptly contracted into margined petioles 3–4 mm. long; heads sessile, solitary among the upper leaves, about 8-flowered; involucre campanulate, 5 mm. high; scales loosely and irregularly imbricated, tomentose on the back, acuminate, the outer ovate-lanceolate, the inner lanceolate; achenes densely hirsute, 2 mm. long; pappus nearly white, 4 mm. long.

Type locality and distribution: eastern Cuba.

40. Vernonia arctata Gleason, Bull. Torrey Club 33: 185. 1906

Shrubby, much branched, 3–8 dm. high; leaves broadly elliptic to obovate-oblong, acute or mucronate, entire, acute or obtuse at the base, brown-tomentose beneath, glabrate above, 1–1.8 cm. long, 0.6–1.1 cm. wide; inflorescence flattened, consisting of several short leafy irregular scorpioid cymes; involucre campanulate, 4–5 mm. high; scales lanceolate, acute, tomentose; achenes pubescent, 2.5 mm. long; pappus nearly white.

Type locality and distribution: New Providence Island, Bahamas.

41. Vernonia obcordata Gleason, Bull. Torrey Club 33: 187. 1906

A much branched shrub 6–9 dm. high, with stiff crooked branches; leaves crowded, broadly obcordate, 0.8–1.5 cm. long, 0.7–1.5 cm. wide, entire, narrowed at the base into petioles 5 mm. long; heads few, single, sessile among the upper leaves; involucre campanulate, 4–5 mm. high; scales ovate-lanceolate or the inner narrower, acute, tomentose; achenes densely hirsute, 2–2.5 mm. long; pappus yellow.

Type locality and distribution: Little Inagua Island, Bahamas.

42. Vernonia bahamensis Griseb. Fl. Brit. W. Ind. 352. 1861

Shrubby, 2 m. tall, repeatedly branched; leaves crowded, spatulate, oblanceolate or narrowly obovate, entire, rounded at the tip, and varying from mucronate to slightly retuse, narrowed at the base into margined petioles, 2–3.5 cm. long, including the petiole, 0.5–1.2 cm. wide; heads few, single, sessile among the upper leaves, 8–13-flowered; involucre campanulate, 3–4 mm. high; scales ovate-lanceolate, tomentose, sharply acute; achenes densely hirsute, 2–2.5 mm. long; pappus nearly white.

Type locality and distribution: Bahama Islands.

III. Lepidaploa, *Scorpioideae aggregatae*

Heads large, sessile or very short-peduncled, aggregated in dense subcapitate clusters terminating the stems and branches. Species 3 or 4, of Cuba, Hispaniola, and possibly of St. Thomas.

43. Vernonia buxifolia (Cass.) Lessing, Linnaea 4: 313. 1829

Lepidaploa buxifolia Cass. Dict. Sci. Nat. 26: 18. 1823.
Proustia domingensis Spreng. Syst. 3: 502. 1826.
Vernonia domingensis DC. Prodr. 5: 30. 1836.

Tall woody vine climbing on trees; branches glabrous, the young twigs pubescent; leaves coriaceous, elliptic-oblong or oblong-obovate, 2–3 cm. long, 1–1.5 cm. wide, acute, entire and somewhat revolute, narrowed at base into petioles 1–2 mm. long, glabrous on both sides, shining above; inflorescence subcapitate; heads 3–6, sessile or on short peduncles covered with scales like those of the involucre; involucre obconic or turbinate, narrowed below, 8 mm. high; scales regularly and closely imbricated in about ten series, appressed, glabrous, obtuse to subacute or somewhat fimbriate, the outer ovate, the inner ovate-lanceolate, the innermost acuminate; achenes obtusely ribbed, sparsely pubescent; pappus nearly white, 5 mm. long, the outer series conspicuous.

Type locality and distribution: San Domingo.

44. **Vernonia montana** sp. nov.

Climbing shrub, 6 m. high; branches glabrous, young twigs puberulent; leaves crowded, firm, oblong-elliptic or rhomboid, 8–13 mm. long, 5–8 mm. wide, acute to rounded at the apex, entire, somewhat revolute, cuneate at base, dark-green and glabrous on both sides, one-nerved or with faint lateral veins, sessile or with petioles 1–2 mm. long; inflorescence subcapitate; heads 2–5, sessile or nearly so, 8-flowered; involucre 5 mm. high, campanulate, rounded at the base; scales regularly imbricated in few series, appressed, obtuse or subacute, glabrous, the outer broadly ovate, the inner ovate-lanceolate to lanceolate; achenes obscurely ribbed, nearly glabrous, 3 mm. long; pappus yellowish, 4 mm. long, the outer series minute.

Type: *Nash & Taylor 1756*, from La Brande to Mt. Balance, Haïti; in the herbarium of the New York Botanical Garden.

45. **Vernonia yunquensis** sp. nov.

Erect, sparingly branched, 1.2 m. tall; stem obscurely angled, very thinly but closely canescent; leaves scattered, firm, dull-green above, pale beneath, broadly elliptic, 4–5 cm. long, 1.8–2.7 cm. wide, obtuse or mucronate, entire, obtuse or acute at base, glabrous and somewhat rugose above, closely gray-tomentose with prominently reticulated veins beneath; heads about 5, sessile or nearly so in a terminal capitate cluster, about 34-flowered; involucre campanulate, 7 mm. high; scales closely imbricated in several series, red or purple, gray-tomentose on the back, acute or subacute and mucronate, the outer broadly ovate, the inner ovate-lanceolate to lanceolate; achenes (immature) hirsute with appressed hairs; pappus 5 mm. long, nearly white, the short outer series conspicuous.

Type: *Underwood & Earle 661*, from El Yunque Mt., Baracoa, Cuba; in the herbarium of the New York Botanical Garden.

46. Vernonia Thomae Benth. Vidensk. Meddel. **1852**: 66. 1852

No specimens of this species have been seen. From Bentham's description it cannot be distinguished from *V. albicaulis* in leaf-character; a drawing in the Gray Herbarium from the collection of Dr. Klatt also refers to that species; and its distribution is suggestive of the same, while quite different from the remaining species of the subsection.

Type locality and distribution: St. Thomas.

IV. Lepidaploa, *Scorpioideae aphyllae*

Heads in scorpioid cymes, not subtended by bracteal leaves. Species mainly Mexican and Central American, only the first two from the West Indies.

(i) Species-group *Havanenses*

Heads about 11-flowered, sessile, in branching, leafless, scorpioid cymes; leaves broad, serrate or nearly entire. Two species, one of Cuba, the other of St. Vincent, which are possibly not related. Their inclusion in the same species-group is largely a matter of convenience, these being the only species of the subsection found in the West Indies.

47. Vernonia havanensis DC. Prodr. **5**: 37. 1836

Vernonia Ottonis Sch.-Bip. Linnaea **20**: 508. 1847.
Vernonia hieracioides Griseb. Mem. Am. Acad. **8**: 511. 1860.
Vernonia cubensis Griseb. Cat. Pl. Cuba 144. 1866.
Vernonia stictophylla Wright; Sauv. Anal. Acad. Ci. Habana **6**: 176. 1869.

Stem woody, erect, branching, reaching a height of 4 m.; branches striate, thinly pubescent or glabrate; leaves numerous, firm, oblong to oblong-obovate, 6-10 cm. long, 2–3½ cm. wide, abruptly short-acuminate or acute, obscurely serrate, obtuse or acute at base, sessile or very short-petioled, scabrous above, puberulent beneath, especially along the veins; upper leaves smaller; inflorescence 1 dm. across, leafy, corymbiform, of short branching cymes; lower heads peduncled, the upper sessile; involucre obconic or campanulate, 4–5 mm. high; scales appressed, regularly imbricated in few series, glabrous, the outer lanceolate, acuminate, the inner oblong, rounded to subacute and frequently mucronate; achenes pubescent, sharply ribbed, 2.5 mm. long; pappus yellowish, 5 mm. long.

Type locality: "Cuba juxta Havanam."

Distribution: Cuba.

Vernonia stictophylla is based on a form with large, thin, obovate leaves, which are conspicuously attenuate at the base. It does not appear to be specifically distinct.

48. **Vernonia pallescens** sp. nov.

Frutescent, branching above, height not reported; branches striate, thinly puberulent or glabrate; leaves membranous, thin, elliptic, 8–10 cm. long, 2.5–4.5 cm. wide, long-acuminate, sharply serrate on the upper half, less so or entire below, narrowed at

the base into short petioles, glabrous on both sides, paler green and glaucescent beneath; inflorescence sparingly branched, leafless; heads all sessile; involucre obconic or narrowly campanulate, 4 mm. high; scales few, loosely imbricated, appressed, the outer narrowly lanceolate, pubescent at the acuminate tips, the inner oblong-lanceolate, acute, nearly glabrous; achenes 2 mm. long, obscurely angled, pubescent; pappus rufescent, 5 mm.long.

Type: *Smith & Smith 992*, from St. Vincent Island; in the herbarium of Columbia University.

(ii) Species-group *Scorpioides*

Heads in short or long, straight or curved, mostly unbranched cymes, about 21-flowered; leaves broad, thin, acute or acuminate. Species of South America, extending north to Nicaragua and Costa Rica.

49. Vernonia brachiata Benth. Vidensk. Meddel. **1852**: 67. 1852

Apparently herbaceous; branches glabrate, strongly angled; leaves thin, broadly elliptic, 10–13 cm. long, 4–6 cm. wide, or the lower much larger, acute or subacuminate, serrulate or entire, gradually attenuate to an obtuse base, nearly glabrous on both sides, short-petioled; inflorescence 1–3 dm. high, freely branched; cymes 1–2 dm. long, straight; heads sessile, 21-flowered, less than 1 cm. apart; involucre campanulate, 3–4 mm. high; scales loosely imbricated, the outer triangular-lanceolate, the inner oblong to oblong-lanceolate, all acute and ciliate; achenes sparsely short-hirsute; pappus tawny-yellow.

Type locality: Costa Rica.

Distribution: Costa Rica, *Pittier 3740*, *6716*, *9315*, and south into South America.

Distinguished from *V. scorpioides* by the attenuate obtuse leaf-bases and short petioles.

50. Vernonia scorpioides (Lam.) Pers. Syn. **2**: 404. 1807

Conyza scorpioides Lam. Encyc. **2**: 88. 1786.

Shrubby; branches terete, softly pubescent; leaves ovate, long-acuminate, abruptly narrowed into a short cuneate base, pubescent beneath; petioles 2–3 cm. long; cymes short, crowded, curved.

Type locality: Brazil.

Distribution: Nicaragua, *Lévy 370*, and throughout tropical South America.

(iii) Species-group *Deppeanae*

Heads 8–21-flowered, in dense, freely branching, leafless, scorpioid cymes; leaves petiolate, entire or nearly so, usually pubescent or tomentose beneath. Mexican and Central American species.

51. Vernonia Aschenborniana Schauer, Linnaea 19: 714. 1847

Shrubby, 2–5 m. tall; stem striate or obscurely angled, ferruginous-pubescent; leaves firm, oblong to lance-oblong, 6–10 cm. long, 2–3 cm. wide, acute, entire or remotely serrulate, somewhat revolute, narrowed at base, scabrous-puberulent above, thinly pubescent beneath with rusty hairs, especially on the veins; petioles pubescent, 2–3 mm. long; inflorescence hemispheric or pyramidal, freely branched, 2–3 dm. wide; heads all sessile or nearly so; involucre broadly campanulate to hemispheric, spreading with age, 3 mm. high; scales loosely imbricated in few series, more or less pubescent and ciliate, cuspidate, the outer broadly ovate, the inner ovate-lanceolate; achenes sharply ribbed, pubescent, 2 mm. long; pappus tawny-yellow, 5 mm. long.

Type locality: Mexico.

Distribution: southern Mexico, Guatemala and Nicaragua.

Forms with oblong-oblanceolate leaves 10 cm. long, 2–3 cm. wide, nearly glabrous beneath and long-attenuate at base were regarded by Schultz as a variety of *V. Aschenborniana*. They occur from Mexico, *Liebmann 355*, *Pringle 3607*, to Guatemala, *Watson 434*, *466a*.

52. Vernonia Deppeana Lessing, Linnaea 6: 398. 1831

?*Vernonia stellaris* La Llave & Lex. Nov. Veg. Descr. 1: 22. 1824.

?*Vernonia fragrans* La Llave & Lex. *l. c.*

Shrubby, freely branching; branches pubescent or tomentose, terete; leaves thin, oblong or narrowly elliptic, 8–10 cm. long, 2.5–3.5 cm. wide, acute, entire or obscurely serrate, narrowed or rounded at base, scabrous above, tomentose or floccose with ferruginous hairs beneath; petioles tomentose, 8–12 mm. long; inflorescence widely branched, pyramidal or hemispheric, 1–3 dm. wide, its branches spreading; heads sessile, 18–21- or rarely 11-flowered; involucre campanulate, 3–4 mm. high; scales loosely imbricated, somewhat spreading at the apex, the outer ovate, acute, pubescent, the inner oblong, acute or subacute, glabrous or ciliate; achenes 2.5 mm. long, sharply ribbed, pubescent; pappus tawny, 5 mm. long.

Type locality: Misantla, Mexico.

Distribution: central and southern Mexico, Guatemala, Costa Rica.

Broad-leaved plants from Costa Rica, *Pittier 93, 1982*, have been distributed as *Vernonia mollis* H.B.K.

53. VERNONIA PATENS H.B.K. Nov. Gen. 4: 41. 1818

? *Vernonia lanceolaris* DC. Prodr. 5: 37. 1836.

? *Vernonia pacchensis* Benth. Pl. Hartw. 134. 1839.

Tall shrub; stem and branches striate or angled, thinly tomentose; leaves firm, oblong, lanceolate or narrowly oblong-lanceolate, 10 cm. long, 3 cm. wide, those of the branches only 1–1.5 cm. wide, acuminate, entire or undulate, somewhat revolute, narrowed at base into petioles 2–3 mm. long, glabrous and somewhat shining but rugose above, pubescent beneath, especially on the prominent reticulated veins; inflorescence lax, spreading, 1–1.5 dm. wide; heads all sessile or nearly so, 21-flowered; involucre hemispheric, 4 mm. high; scales coriaceous, loosely imbricated in few series, the outer broadly ovate, blunt, ciliate, the inner ovate-lanceolate or oblong, glabrous or ciliate, rounded or obtuse and minutely cuspidate; achenes obscurely angled, 2 mm. long, pubescent; pappus tawny-yellow, 5 mm. long, the outer series distinct but short.

Type locality: "In America meridionali."

Distribution: southern Mexico to Nicaragua and South America.

A form with leaves narrowly lance-oblong to elliptic, 12–20 cm. long, 2–4 cm. wide, very thin and glabrous, has been distributed as *V. lanceolaris* DC. It is perhaps merely a glabrous-leaved form of *V. patens*. Chiapas, *Nelson 3815;* Nicaragua, *Baker 2257*.

The three preceding species are closely related and so confused by intergrading variations that their separation is extremely difficult. *V. Deppeana* is perhaps the most easily recognized because of its elliptic, softly cinereous-tomentose leaves. In general habit, foliage and involucre *V. Aschenborniana* and *V. patens* are much alike, and the principal distinction, based on the number of flowers in the head, is possibly not a legitimate one. No authentic specimens have been examined, so that the exact status of the species and the four supposed synonyms is not certain. *Vernonia mollis* H.B.K. and *V. cordata* H.B.K. also belong in this species-group. A fragment of the latter in the Gray Herbarium closely resembles *V. Deppeana* except for the subcordate leaves, and *V. mollis* also is possibly a form of the same species.

54. VERNONIA CANESCENS H.B.K. Nov. Gen. 4: 35. 1818

Vernonia bullata Benth. Vidensk. Meddel. 1852: 67. 1852.

Apparently suffrutescent and erect, simple to the inflorescence or sparingly branched above; stems pubescent or becoming glabrous; leaves thin, oblong-lanceolate, 8–18 cm. long, 2–5 cm. wide, long-acuminate, entire, narrowed at the base, rugose or nearly flat, scabrellate or glabrous above, prominently reticulate and softly strigose-pubescent beneath; petioles 3–5 mm. long; inflorescence large, lax, 1–3 dm. wide, its branches few, divaricate, 8–20 cm. long; heads sessile, about 1 cm. distant, 21-flowered; involucre campanulate, 4–5 mm. high; scales loosely and irregularly imbricated, all erect, lanceolate, hirsute, acuminate into subulate tips; achenes 2 mm. long, hirsute with erect hairs; pappus white, 4 mm. long.

Type locality: Peru.

Distribution: from southern Mexico to tropical South America.

The abundant material at hand for examination showed that this species was extremely variable, and an unbroken series of forms could be traced from plants with the habit described above, narrow, nearly flat leaves attenuate at both ends and barely scabrellate above, to others of strikingly different character. As examples of plants corresponding most closely to the description and plate of Kunth may be cited the following: *Ervendberg 47*, Tantoyuca, Mexico; *Donnell Smith 2837*, Zacatepéquez, Guatemala; *Nelson 3797* and *3798*, Chiapas, Mexico; *Tonduz 11733*, *Pittier 6886* and *3697*, from Costa Rica; and *Fendler 160*, from Panama. Approximating the type in the shape of the leaves, but with less attenuate or even subrotund base, more prominent veins and harsher pubescence are *Palmer 492*, Acapulco, Mexico; *Lehmann*, Guatemala; *Pittier 1660*, *Tonduz 1805*, *7197*, *7304* and *11626*, Costa Rica. As extreme forms may be mentioned a sheet from Panama collected by Seemann, and two from Costa Rica, *Donnell Smith 4867* and *Cooper 5839*. These have short, subacuminate to obtuse, subcordate leaves, very scabrous and bullate above, with exceedingly prominent veins and dense strigose pubescence beneath. *Cooper 5839* was collected in Cartago, the type locality of *Vernonia bullata* Benth., with which it agrees in every particular. Compared with a typical form these seem abundantly distinct, but the intergrading forms indicate that they are merely an aberrant form. Another interesting variation is presented by *Pittier 4930* from Costa Rica, in which the leaves are small, narrowly oblong-lanceolate, and densely and softly pubescent above.

V. Lepidaploa, *Paniculatae dichotomae*

Inflorescence paniculate, dichotomously branched, the corresponding internodes of equal length. One species.

55. Vernonia menthaefolia (Poepp.) Lessing, Linnaea 4: 268. 1829

Eupatorium menthaefolium Pöpp. in Sprengel, Syst. Veg. 3: 412. 1826.

Vernonia Grisebachii Sch.-Bip. Jour. Bot. 1: 231. 1863.

Stem woody, erect, 1–2 m. high, minutely puberulent; leaves thin, bright-green, ovate-oblong, 5–10 cm. long, 1.5–3.5 cm. wide, acute or acuminate, entire, undulate or sparsely serrate with low teeth, broadly cuneate to subrotund at base, scabrellate above, nearly glabrous and paler green beneath; petioles 1–1.5 cm. long; bracteal leaves similar but smaller; inflorescence loose, pyramidal, 2–3 dm. wide, dichotomously branched; heads 11–18-flowered, on peduncles 3–5 mm. long; involucre broadly campanulate, closely imbricated, 4–5 mm. high; scales coriaceous, puberulent, the outer short, ovate, obtuse or acute, the inner oblong-lanceolate, rounded and cuspidate; achenes 3 mm. long, minutely pubescent on the low ribs; pappus flavescent or nearly white, 6 mm. long, the outer series short, indistinct.

Type locality and distribution: Cuba.

This, the single species of the subsection, is distinguished not only by the structure of its inflorescence, but also by its distribution. It is the only paniculate form in the West Indian region, with the single exception of *V. insularis*, and is doubtless phylogenetically distinct from all the remaining Paniculatae. The exception mentioned is, as has been shown, of Mexican origin. Schultz's *V. Grisebachii* was intended to include forms with larger heads and more numerous flowers, but from his description cannot be distinguished from authentic specimens of *V. menthaefolia*.

VI. Lepidaploa, *Paniculatae umbelliformes*

Branches of the panicle mostly aggregated or separated only by shortened internodes; peduncles approximately uniform in length, the inflorescence consequently appearing subumbellate. The heads form regular rounded clusters which are in turn united into large pyramidal, hemispheric or depressed inflorescences. The subsection is a very natural one; its nine component species are closely interrelated, and are all endemic to the mountain regions of Mexico.

56. Vernonia corymbiformis DC. Prodr. 5: 62. 1836

Erect shrub, divaricately branched above; stem striate, glabrous or puberulent; leaves ample, thin, bright-green, elliptic, 8–12 cm. long, 3–5.5 cm. wide, acute or subacuminate, entire, narrowed at the base, almost glabrous on both sides, prominently veined; petioles 1–2 cm. long; upper leaves similar but smaller; inflorescence depressed-hemispheric; involucre obconic-campanulate, 8 mm. high; scales loosely imbricated, straight, erect or the outer spreading, all linear-subulate, glabrous, more or less tinged with purple; immature achenes glandular, obtusely ribbed; pappus almost white, 6 mm. long.

Type locality and distribution: Mexico.

To this species Mr. J. M. Greenman has referred the plant described above, *Nelson 4098*, collected in the state of Jalisco. That this identification is correct is by no means certain. De Candolle's description of this species and the following are almost identical, the only points of difference being in the pubescence of the leaves, and the width and texture of the scales; although these differences are by no means striking. So far as can be decided from the description alone the plant in question most nearly resembles *V. corymbiformis*. It is at once separated from *V. Karwinskiana* by the larger broader leaves and the straight subulate scales.

57. Vernonia Karwinskiana DC. Prodr. 5: 62. 1836

Erect, 1 m. high; stem purple, glabrous to puberulent; leaves firm, ovate-lanceolate to oblong, 3–10 cm. long, 1.5–3 cm. wide, scabrous above, pubescent beneath, at least on the veins; inflorescence depressed-hemispheric; scales linear-lanceolate or narrowly oblong, tapering to an acute or subacute tip, thin, appressed at base, loose and a little spreading at tip.

Type locality and distribution: Mexico.

Two forms of distinct leaf-habit occur. In the first the leaves are narrowly oblong or elliptic-oblong, tapering at both ends, and about five times as long as wide. In the other they are ovate-lanceolate, abruptly narrowed to an obtuse base, and about three times as long as wide. In involucral character they are apparently the same.

58. **Vernonia jaliscana** sp. nov.

Stem suffrutescent, about 1 m. high, erect from a thick woody base, simple to the inflorescence, nearly terete, scabrellate or becoming glabrous; leaves thick, subcoriaceous, elliptic-oblong, 7–11 cm. long, 2.5–4.5 cm. wide, obtuse or subacute, entire or undulate,

obtuse to rounded or subcordate at base, scabrous on both sides, especially above; petioles about 5 mm. long; upper leaves much reduced, the axiles and rameals only 1–2 cm. long; branches of the hemispheric or depressed inflorescence pubescent; peduncles about 1 cm. long; heads 21-flowered; involucre broadly campanulate, 7 mm. high; scales closely imbricated, appressed, glabrous, the exposed portion purple, the outer lanceolate, cuspidate, the inner narrowly oblong, attenuate or sharply acute, mucronulate; achenes 3 mm. long, glandular-puberulent, sharply ribbed; pappus nearly white, 7 mm. long, outer series indistinct.

Type: *Pringle 2165* from Guadalajara, Jalisco; in the Gray Herbarium. Here are also referred *Pringle 2984* and *9994*, from the same locality, and *Palmer 745* from Rio Blanco, Jalisco. One sheet of *Pringle 9994* has narrowly oblong-oblanceolate leaves narrowed at the base. In other respects it is like the type, and a second sheet of the same number has normal leaves.

Vernonia jaliscana has been distributed as *V. serratuloides*, with which it is undoubtedly closely related, as shown by the character of the inflorescence, the shape and color of the involucre, the general habit of the plant, and its geographical distribution. It is amply distinguished by its broad, very scabrous leaves, its 21-flowered heads, and more attenuate involucral scales.

59. **Vernonia umbellifera** sp. nov.

Stem erect, suffrutescent, freely branched above and with numerous smaller branches from the lower axils, purplish-brown, striate, glabrous; cauline leaves thick, ascending, narrowly lanceolate, 5–8 cm. long, 1 cm. wide or less, tapering to an acute tip, narrowed or barely rounded at base, entire or remotely serrulate, revolute, glabrous above or scabrous near the margin, glabrous beneath, the midvein very prominent, the lateral veins obscure; petioles 3–5 mm. long; axile leaves resembling the cauline but reduced in size; bracteal leaves sessile, sharply acuminate, 1.5 cm. long or less, or the uppermost subulate; inflorescence pyramidal; heads 8–11-flowered, aggregated in subumbellate clusters on peduncles 3–10 mm. long, or rarely sessile; involucre narrowly campanulate, 8 mm. high; scales all erect, appressed, glabrous or sparsely arachnoid, the exposed portion purple, the inner oblong, acute or abruptly acuminate, the outer shorter, lanceolate; achenes glandular, 2 mm. long, obscurely ribbed; pappus pale-tawny, 6–7 mm. long, the outer series indistinct.

Type: *Pringle 2316*, from the plains of Guadalajara, state of Jalisco; in the herbarium of Columbia University. A second sheet, *Pringle 2132*, from the same locality, is also referred here.

In general habit the species closely resembles *V. serratuloides*, but is distinguished by its narrow, glabrous, revolute, obscurely reticulated leaves.

60. Vernonia serratuloides H.B.K. Nov. Gen. **4**: 33. 1818

Perezia paniculata A. Gray, Proc. Am. Acad. **21**: 393. 1886.

Stems glabrous or puberulent, branching above; leaves narrowly oblong, 7–10 cm. long, 1.5–3 cm. wide, irregularly serrate, truncate to rounded or rarely narrowed at the base, scabrous above, pubescent or puberulent and strongly reticulate beneath; scales abruptly acuminate and cuspidate, purple usually only near the tip.

Type locality: "Valladolid de Mechoacan," Mexico.

Distribution: southwestern Chihuahua, *Palmer 279*, to Jalisco.

61. Vernonia oaxacana Sch.-Bip. in Klatt, Leopoldina **20**: 74. 1884

Shrubby, the stems prominently striate, thinly pubescent; leaves elliptic-oblong, 10 cm. long, 3 cm. wide, acute, entire or remotely denticulate narrowed at the base, scabrellate above, floccose beneath; petioles 5–12 mm. long; upper leaves smaller; inflorescence hemispheric; heads crowded, all peduncled; involucre campanulate, 5 mm. high; scales ovate-lanceolate to narrowly oblong, glabrous, acute, cuspidate.

Type locality: "S. Carlos," Mexico.

Distribution: Oaxaca and Chiapas, *Seler 1956*.

62. **Vernonia capreaefolia** (Sch.-Bip.) sp. nov.

Vernonia Ehrenbergiana capreaefolia Sch.-Bip. *ined.*

Stem erect, at least 1 m. high, suffrutescent, terete, striate, scabrous-puberulent or glabrate, simple to the inflorescence; leaves firm, broadly elliptic, 9–13 cm. long, 2.5–5 cm. broad, regularly tapering to an acute tip, coarsely serrate, narrowed or somewhat cuneate at base, very scabrous and dark-green above, paler and nearly glabrous beneath except for scabrous pubescence along the prominently reticulated veins; petioles 2–10 mm. long; upper and axile leaves similar but smaller; bracteal leaves 1 cm. long or less; inflorescence broadly pyramidal, 1–2 dm. wide, its branches puberulent; heads about 11-flowered, on short peduncles; involucre campanulate, 5 mm. high; scales loosely but regularly imbricated, glabrous or nearly so on the back, minutely ciliate, the outer lanceolate, acuminate and cuspidate, the inner ovate-oblong to narrowly oblong, acute, or subacute and mucronulate; achenes 2.5 mm. long, sharply ribbed, sparsely pubescent on the angles and glandular in the furrows; pappus nearly white, 5 mm. long.

Type: *Schaffner 117*, from Orizaba, Mexico; in the Gray Herbarium. Other sheets are *Nelson 1979*, from Oaxaca, *Nelson 4067* and *Pringle 2943*, from Jalisco. It is distinguished from *V. liatroides* by the larger, regularly elliptic, more prominently reticulated leaves with a different type of pubescence. The sheet selected for the type has but a few heads and leaves proportionately broader than those of the other specimens, but is labeled in Schultz's handwriting with the varietal name cited above.

63. Vernonia liatroides DC. Prodr. **5**: 34. 1836

Eupatorium tulanum Klatt, Abh. Naturf. Ges. Halle **15**: 324. 1882.

Herbaceous or suffrutescent, erect; stem striate, puberulent; leaves firm, elliptic-oblong or oblong-oblanceolate, 5–8 cm. long, 1.5–2 cm. wide, acute or short-acuminate, acute or cuneate at base, sharply serrate, especially toward the tip, scabrellate above, ferruginous-puberulent below, sessile or with petioles 1–2 mm. long; bracteal leaves similar but much smaller; inflorescence depressed-hemispheric, of rounded subumbellate cymes; heads about 11-flowered, in clusters of 2 or 3 on peduncles 3–5 mm. long; involucre campanulate, 3–4 mm. high; scales lanceolate or the inner oblong-lanceolate, glabrous or nearly so, regularly tapering to an acute, cuspidate, purple tip; achenes ribbed, prominently glandular in the furrows, 1.5–2 mm. long; pappus flavescent, 4 mm. long, the outer series distinct but short.

Type locality: "in Mexico inter Tula et Tampico."

Distribution: Tula to Tampico, *Berlandier 2139;* San Luis Potosi to Tampico, *Palmer 1081;* Orizaba, *Botteri 493;* western Mexico, *Seemann*. The last cited specimen has peculiarly narrow leaves, pubescent beneath.

64. Vernonia Sinclairi Benth. Bot. Voy. Sulph. 109. 1845

Vernonia Ehrenbergiana Sch.-Bip. Linnaea **20**: 513. 1847.

Stems herbaceous, erect, 1–2.5 m. high, cinereous-pubescent or glabrate with age; leaves elliptic or elliptic-oblong, 3–8 cm. long, 1.2–4 cm. wide, acute, serrate or nearly entire, scabrous above, cinereous-pubescent beneath; veins reticulated, the midvein prominent above; petioles 3–5 mm. long; bracteal leaves gradually reduced in size; inflorescence hemispheric or pyramidal; heads 8–11-flowered, on subulately bracted peduncles 2–5 mm. long; involucre campanulate, 4–5 mm. high; scales all appressed, purple-tipped, nearly glabrous on the back, the outer triangular-lanceolate, cuspidate, ciliate, the inner oblong-lanceolate, obtuse, cuspidate, entire;

achenes 2.5 mm. long, sharply ribbed when mature, glandular in the furrows; pappus nearly white, 4–5 mm. long, the outer series indistinct.

Type locality: "San Blas and Tepic."

Distribution: Oaxaca, *Smith 290;* Puebla, *Pringle 6246;* Orizaba, *Bourgeau 3339.*

VII. Lepidaploa, *Paniculatae verae*

Branches of the panicle irregularly branched, the internodes uneven in length; uppermost heads generally sessile or short-peduncled, the lower heads on more elongated peduncles, frequently surpassing the upper, the whole forming a crowded or lax, irregularly hemispheric or depressed panicle. Herbaceous, except in the first species-group.

By far the greater number of the North American paniculate species of *Lepidaploa* belong to this subsection, which extends from Central America through Mexico and the eastern United States. One species has also crossed into the Bahamas. A number of well-marked species-groups may be recognized, each characterized by certain morphological structures and by a definite geographical distribution. In the following account the species will be taken up by groups in order of their distribution, the Mexican first, then those of the southwestern United States, and lastly those of the Atlantic coast.

(i) Species-group *Alamanianae*

Heads large, many-flowered; involucral scales oblong, with parallel sides, mucronate or aristate, the outer reflexed or spreading. Two species of the mountains of lower Mexico.

65. Vernonia Alamani DC. Prodr. 5: 61. 1836

Erect shrub, 1–2 m. high; leaves firm, dull-green, elliptic or elliptic-oblong, 9–14 cm. long, 3–7 cm. wide, broadest at the middle and tapering regularly to both ends, finely serrulate or subentire, puberulent or glabrate beneath; venation not prominently reticulate; involucre 15 mm. high, its scales triangularly acute or subrotund at the apex, with an awn 2 mm. long.

Type locality: Mexico.

Distribution: Morelos, Mexico, Oaxaca and Guanajuato, at altitudes of 1,800 to 2,200 meters.

66. **Vernonia dictyophlebia** sp. nov.

Shrubby, erect, 1–2 m. high; stem terete or obscurely striate, puberulent or thinly tomentose with brown or gray hairs; cauline leaves firm, spreading, ovate or ovate-elliptic, 6–10 cm. long, 3–6 cm. wide, broadest below the middle, tapering to an acute or subacuminate tip, obtuse to broadly rounded or subcordate at base, sharply irregularly serrulate, green and scabrous above, paler beneath and pubescent on the light-colored, very prominent, closely reticulated veins; petioles pubescent, 3–10 mm. long; upper and rameal leaves similar, but successively reduced to 1.5 cm. in length; inflorescence depressed-hemispheric, 1–2 dm. wide; heads 15–20 mm. wide, all on peduncles 2–4 cm. long with a few scarious bracts resembling the outer scales; involucre broadly campanulate, 12–15 mm. high; scales loosely but regularly imbricated in numerous series, glabrous, purple or purplish-green, with scarious margins, the outer spreading or reflexed, the inner narrowly oblong, obtuse to broadly rounded or retuse at the tip, minutely cuspidate or with the midnerve prolonged into an awn not over 1 mm. long; achene 4 mm. long, prominently ribbed, densely glandular in the furrows; pappus white, 8 mm. long.

Guanajuato, *Dugès;* Michoacan, *Pringle 3347*, *Holway 3105;* Oaxaca, *Gonzáles & Conzatti 867*. The type is *Pringle 3347*, in the herbarium of Columbia University.

Sharply distinguished from *V. Alamani* by the shape and pubescence of the leaves and by the shape of the involucral scales.

(ii) Species-group *Texanae*

Heads few, 21–many-flowered, all on ascending peduncles, forming a lax very irregular inflorescence; leaves ascending, broadest at or above the middle, scabrous above, glabrous or nearly so beneath. Four species of the Sonoran region in Mexico and the Texan region of the United States. The three Mexican forms occupy a continuous area, none of them occurring north of the Rio Grande. The single Texan species is geographically distinct from the others. It resembles *V. Ervendbergii* very closely and is to be regarded as a comparatively recent offshoot from that species. Once seen, the group is always recognized by its singularly loose irregular inflorescence.

67. Vernonia texana (A. Gray) Small, Fl. S. U. S. 1160. 1903

Vernonia angustifolia texana A. Gray, Syn. Fl. 1²: 91. 1884.

Type locality: Texas.

Distribution: from central Arkansas south and southwest to the Gulf of Mexico.

As has been already mentioned the species is entirely distinct geographically and structurally from the southeastern *V. angustifolia* with which it was at first associated. A sheet in the herbarium of Columbia Universiiy, collected by J. Reverchon at Dallas, Texas, is somewhat abnormal. The leaves are lanceolate, widest near the base, proportionately broader and more sharply toothed than in the type; the corymb is small and compact and the involucral scales merely acute. It appears to be a xerophytic form.

68. Vernonia Ervendbergii A. Gray, Proc. Am. Acad. **17**: 203. 1882

Erect, 5–9 dm. high; stem angled, glabrous, branching above; leaves firm, lanceolate, oblong-lanceolate or narrowly elliptic, 5–10 cm. long, 1–3 cm. wide, acute or acuminate, narrowed to a sessile base, remotely serrulate, scabrellate above, glabrous beneath; inflorescence very loose and irregular; heads generally long-peduncled, 21–29-flowered; involucre broadly campanulate, or with age nearly hemispheric, 4–5 mm. high; scales all appressed, irregularly imbricated, glabrous or barely ciliate, lanceolate or oblong-lanceolate, acute or short-acuminate; achenes sharply ribbed, sparsely pubescent, 3.5 mm. long; pappus tawny, 5–6 mm. long, the outer series short, inconspicuous.

Type locality: Tantoyuca and Monclova, Mexico.

Distribution: northwestern Mexico, from Coahuila south to Vera Cruz.

The species is quite variable in foliage, extreme forms being represented by *Palmer 750* (cotype) with long narrow leaves approximating those of *V. texana*, and *Pringle 11606*, with elliptic, sharply and coarsely serrate leaves reaching 4 cm. in width.

69. Vernonia Schaffneri A. Gray, Proc. Am. Acad. **17**: 204. 1882

Erect, simple to the inflorescence, 3–5 dm. high; stem obscurely angled, glabrous below, pubescent above; leaves numerous, thin, bright-green, obovate, oblong, or broadly elliptic, 5–8 cm. long, 2–3.5 cm. wide, obtuse, tapering to a sessile base, entire or serrulate toward the tip, scabrellate above, glabrous or nearly so beneath; vein sprominent beneath, reticulated; upper leaves but little smaller; inflorescence loose, flattened, 1 dm. wide; heads 15 or less, all peduncled, about 40-flowered; involucre campanulate-hemispheric, 7–8 mm. high; scales purple, all regularly and closely imbricated, glabrous or minutely ciliate, the outer lanceolate, acute, the inner oblong-lanceolate, obtuse or subacute; achenes sparsely glandular-puberulent, 3 mm. long; pappus tawny, 6 mm. long.

Type locality: San Luis Potosi.
Distribution: San Luis Potosi and Hidalgo.

70. Vernonia Greggii A. Gray, Proc. Am. Acad. **17**: 204. 1882

Vernonia Greggii Palmeri A. Gray *l. c.*

Erect, simple to the inflorescence; stem strongly striate, puberulent or glabrate; leaves firm, oblong-lanceolate, 8–10 cm. long, 1.5–2.5 cm. wide, broadest at the middle and tapering regularly to both ends, acute, serrulate, scabrous above, nearly glabrous beneath, with a prominent midvein, sessile or very short-petioled; upper leaves gradually smaller; heads large, many-flowered, on subulately bracted peduncles; involucre hemispheric or broadly campanulate, 8–10 mm. high; scales oblong-lanceolate or lanceolate, acuminate, glabrous; achenes 5 mm. long, sparsely puberulent, sharply ribbed; pappus tawny, 7 mm. long.

Type locality: "Northern Mexico."

Distribution: Coahuila, *Pringle 2850*, *Palmer 753*.

(iii) Species-group *Crinitae*

Heads very large, many-flowered, relatively few in number; scales narrowly acuminate or filiform; leaves linear or narrowly lanceolate. One Sonoran species in northwestern Mexico and an Ozarkian species in the United States.

71. Vernonia Bolleana Sch.-Bip. Bot. Voy. Herald, 297. 1856

Stem nearly terete, floccose, simple; leaves numerous, thick, narrowly linear, 6–8 cm. long, 3 mm. wide, glabrous and dark-green above, lanate beneath, one-nerved, the margin revolute; heads few, many-flowered, on peduncles 4–6 cm. long; involucre turbinate-campanulate, 15 mm. high; scales imbricated in several series, straight, erect, linear to linear-oblong, acuminate, densely arachnoid near the base, glabrate or resinous towards the tip; immature achenes densely canescent, obtusely ribbed; pappus nearly white, 8 mm. long, the outer series distinct.

Type locality and distribution: Sierra Madre, Mexico.

The single specimen examined is in the Gray Herbarium, collected by Seemann in northwestern Mexico, and probably a cotype or fragment of the original. It is about 4 dm. high, and bears three heads.

72. VERNONIA CRINITA Raf. New Fl. N. Am. 4: 77. 1836

Vernonia arkansana DC. Prodr. 7: 264. 1838.

Stem erect, simple or sparingly branched, leafy, glabrous and somewhat glaucous, or minutely puberulent, striate, 1–3 m. high; leaves numerous, narrowly lanceolate or broadly linear, 8–15 cm. long, 0.5–2 cm. wide, acuminate, tapering at the base, entire or with minute scattered callous teeth, glabrous or sparingly pubescent; inflorescence irregular, with 5–40 heads; peduncles stout, thickened above, frequently pubescent; heads 55–89-flowered; involucre hemispheric, 12–20 mm. wide; scales glabrous or somewhat pubescent, lanceolate or ovate at the appressed base, acuminate into long flexuous tips about equaling the pappus; achenes strongly ribbed, glabrous or nearly so, 5–6 mm. long; pappus dull-purple, 6–7 mm. long.

Type locality: "In Louisiana and Arkanzas."

Distribution: Missouri, Kansas, Arkansas and Indian Territory.

Specimens agreeing with this description are very numerous in herbaria and correspond most closely with Rafinesque's original description. The species is very variable in the length and pubescence of the involucral scales, the pubescence and serration of the leaves and the general habit. Forms occur apparently intermediate with other species and have been regarded as hybrids, but since all evidence is lacking as to their origin or stability, they can at present be mentioned merely as intermediate forms, leaving their final disposal to future investigation.

1. *V. crinita-missurica.* Leaves narrow, minutely but sharply serrate, tomentulose-pubescent on the veins beneath; heads smaller than in the type; tips of scales much shorter than the pappus and little exceeding the involucral cup. Specimens with this habit have been collected at St. Louis, *Eggert*, Aug. 10, 1886, and De Soto, Missouri, *Hasse*, July 7, 1887.

2. *V. crinita-interior Baldwini.* Leaves as in the type, but more pubescent, involucre 8–9 mm. high, the scales acuminate, short, recurved. Missouri, *E. Hall.*

3. *V. crinita-interior.* Leaves as in the type, closely and finely tomentose beneath; scales long-acuminate but not filiform, all erect, equaling or a little shorter than the pappus; heads 10 mm. high. Choctaw Agency, Indian Territory, 1853–4, *Bigelow.* The plant might almost as well be connected with *V. marginata.*

(iv) Species-group *Lindheimerianae*

Leaves narrow, entire or sparingly serrate, tomentose or pubescent beneath; heads 21-flowered; scales all appressed, but irregularly imbricated, the exposed portion of the inner ones disproportionately longer than that of the middle or outer ones. Species all Texan.

73. Vernonia Lindheimeri A. Gray, Proc. Am. Acad. 1: 46. 1846

Type locality: "in rupestribus prope New Braunfels, Texas."

Distribution: East-central and southern Texas, from the vicinity of Dallas south and southwest to the Gulf of Mexico, and possibly extending west to New Mexico. The species prefers dry rocky hills and prairies.

V. Lindheimeri is a well-marked form of but little variability, and that mostly in the size of the plant and the number of heads in the inflorescence. One sheet, *Hayes 339*, has leaves white-tomentose on both sides, but that may be a juvenile condition.

74. Vernonia guadalupensis Heller, Muhlenbergia 1: 28. 1901.

Erect, 4–10 dm. high, simple to the inflorescence, the stem faintly striate, thinly covered with white pubescence or nearly glabrous; leaves numerous, crowded, thin or firm, usually somewhat scythe-shape, narrowly linear-lanceolate or linear, 8–15 cm. long, 0.5–1 cm. wide, entire or sparsely toothed, acute or acuminate, narrowed below, glabrous above, thinly pubescent beneath, the midvein prominent, yellowish; inflorescence corymbose, irregular, rather compact; heads all peduncled or rarely a few sessile, mostly 21-flowered, 12 mm. high at maturity; involucre campanulate, 6 mm. high; scales all appressed, irregularly imbricated, the inner much exceeding the outer, more or less thinly white-tomentose, ciliate or arachnoid, rounded or obtuse to acute or acuminate; achenes prominently ribbed, pubescent; pappus tawny to purple, the outer series conspicuous.

Type locality: Kerrville, Kerr County, Texas.

Distribution: central Texas.

The specimens cited above agree throughout in the one character of irregularly imbricated bracts, but otherwise they show a wide range of variability. The leaves are sometimes straight (*Stanfield*) and the variation in leaf-pubescence and involucral scales is very wide.

The specific nature of *V. guadalupensis* is indeed doubtful.

Early collections by Reverchon refer to it as a hybrid between *V. Lindheimeri* and *V. noveboracensis*. Later Gray spoke of it as an apparent hybrid between *V. Lindheimeri* and *V. Baldwini*; and more recently it has been regarded as a hybrid with *V. interior*. In the original description Heller states that it occurs with the two supposed parent species. Its close relationship with *V. Lindheimeri* cannot be doubted from morphological evidence; its hybrid nature must be determined experimentally.

75. Vernonia Reverchonii sp. nov.

Erect, 5 dm. high; stem glabrous or sparingly pubescent at the middle, simple to the inflorescence; leaves numerous, firm, spreading, narrowly oblong-lanceolate, 5–8 cm. long, 4–7 mm. wide, acute and mucronate, narrowed below, entire and slightly revolute, minutely scabrous above, thinly short-pubescent beneath, one-nerved with faint lateral veinlets; inflorescence flattened, compact, 7 cm. wide, with about 25 sessile or peduncled 21-flowered heads; involucre broadly campanulate or hemispheric, 6 mm. high; scales erect, appressed, oblong, rounded and mucronate at the tip, tomentose on the back except for a glabrous marginal line, densely arachnoid-ciliate, the exposed portion of the inner somewhat exceeding that of the outer; immature achenes puberulent; pappus purple-tawny, the outer series conspicuous.

Type: *Reverchon 402*, from Seymour, Texas; in the herbarium of the Missouri Botanical Garden.

The relationship of *V. Reverchonii* and *V. Lindheimeri* is shown by the general character of the involucre, although otherwise it is not far from *V. tenuifolia* or *V. marginata*. Regarded as the latter species by its original collector it may possibly be a hybrid between *V. Lindheimeri* and either of the two others. In any case it is parallel with *V. guadalupensis* and like it had best be regarded as a distinct species until conclusive evidence is at hand proving it of hybrid origin.

(v) Species-group *Fasciculatae*

Leaves normally narrow, glabrous or nearly so on both sides, and usually deeply pitted below; inflorescence flattened, compact; heads about 21-flowered, fewer in *V. Lettermanni*, more numerous in *V. illinoensis*. The latter species may be regarded as an aberrant xerophytic type of the group, having broad leaves which are tomentose below, and heads with 34 or more flowers. It is included under the Fasciculatae mainly on account of its distribution, although there

is also some morphological ground, as given under the description of the species. The Fasciculatae range from Texas northward through the Prairie province and follow its eastern extension to Ontario. With the exception of *V. fasciculata* and *V. illinoensis* the ranges of the different species overlap but little or not at all. *V. Lettermanni* is found only beyond the limits of the Prairie province in the Ozark region.

76. VERNONIA TENUIFOLIA Small, Bull. Torrey Club **25**: 145. 1898

Type locality: "in dry soil, western Texas."

Distribution: western and southwestern Texas and adjacent New Mexico, mainly south of, but overlapping, the range of *V. marginata*.

77. VERNONIA MARGINATA (Torr.) Raf. Atl. Jour. **1**: 146. 1832

Vernonia altissima marginata Torr. Ann. Lyc. Nat. Hist. **2**: 210. 1827.

Vernonia Jamesii Torr. & Gray, Fl. N. Am. **2**: 58. 1841.

Type locality: "On the Arkansa?"

Distribution: extreme southwestern Kansas, western Oklahoma, northwestern Texas and eastern New Mexico.

78. VERNONIA LETTERMANNI Engelm. Proc. Am. Acad. **16**: 78. 1880

Type locality: "Arkansas, on Cooper's Creek, Dr. J. M. Bigelow, and on sand-bars of the Washita, Lettermann."

Distribution: on sand-bars and gravel-beds, in the lower Ozark region of central Arkansas and Indian Territory.

79. VERNONIA CORYMBOSA Schw. Long's Sec. Exp. **2**: 394. 1824

Vernonia Schweinitzii Steud. Nomencl. Bot. ed. 2. **2**: 755. 1841.

Stem erect, glabrous, usually red, 4–8 dm. high; leaves firm, pale-green, erect or ascending, sessile, ovate-lanceolate, 4–7 cm. long, 1–2.5 cm. broad, acute, regularly serrate with low teeth, somewhat scabrous above, especially near the margin, glabrous and deeply pitted below, pinnately veined; inflorescence hemispheric, very dense, 5 cm. across; heads sessile or short-peduncled, 10–12 mm. high at maturity, 21-flowered; involucre broadly campanulate or

hemispheric, 8 mm. high; scales purple, appressed, ovate-oblong, glabrous or sparsely ciliate, rounded to obtuse or subacute; achenes 3.5 mm. long, nearly glabrous; pappus purplish, 6–7 mm. long, the outer series inconspicuous.

Type locality: "Northwestern Territory."

Distribution: in wet ground, from Eastern North Dakota to western Nebraska. North Dakota: Valley City, *Miss L. L. Perrine;* Devil's Lake, *Geyer 268;* Leeds, *Lunell;* upper Missouri River, *Rothkammer 491.* Nebraska: Big Spring, *Rydberg 135;* Fort Kearney, *Herb. Engelmann;* Platte River, *Fremont.*

Hesitatingly regarded as distinct by Schweinitz, the species has since been included with *V. fasciculata*, from which it is distinguished by the wide, merely acute leaves and the broader involucre. In geographical distribution it is also distinct, its range lying to the north and northwest of that of *V. fasciculata.*

80. Vernonia fasciculata Michx. Fl. Bor. Am. 2: 94. 1803.

Stem erect, striate, glabrous, purple or greenish-purple, 6–10 dm. high; leaves numerous, ascending, thin, bright-green, linear, long-acuminate, narrowed to a sessile base, sharply dentate with curved ascending teeth, glabrous on both sides, 1-nerved with faint lateral veinlets, 8–13 cm. long, 4–7 mm. wide; inflorescence dense, hemispheric, 4–6 cm. across; heads crowded, sessile or short-peduncled, 21-flowered; involucre campanulate, 6 mm. high; scales all appressed and regularly imbricated, acute, glabrous, or sparingly ciliate, the exposed portion red or purple; achenes puberulent in the furrows, 3 mm. long; pappus purple.

Type locality: "in pratis illinoensibus."

The form chosen for description is abundant in open places in grassy swamps and in wet grounds throughout Illinois, and agrees most nearly with Michaux's character "foliis longo-linearibus." The species as at present understood is widely variable, and some or all of the three additional forms recognizable in herbarium material may eventually prove distinct. Still, they appear to intergrade, and in one case at least the ecological habit is different from the normal. The evidence at hand is not sufficient to warrant discussion of their systematic rank, and they will merely be described as forms which the species may assume. As examples of the type may be taken three sheets in the herbarium of the New York Botanical Garden, all from Illinois: Chicago, *Moffatt;* Oquawka, *Patterson;* and Chicago, *Babcock.*

2. Leaves broader, the width about one-sixth of the length, incon-

spicuously serrate, puberulent beneath; inflorescence pubescent; involucre campanulate-cylindric, 8 mm. high; scales obtuse or mucronate, ciliate. Abundant in swamps in central Illinois; Champaign, *Gleason 2843*.

3. Foliage glabrous; leaves ample, 8–15 cm. long, 1.5–2.7 cm. wide, sharply and saliently dentate, the lateral veinlets prominent; inflorescence large, open, irregular; heads numerous; involucre as in the type; scales in few series, sharply acute or short-acuminate, ciliate. *Pammel 32*, from Clinton, Iowa, is an example of the form, to which, in fact, most of the herbarium material examined belongs.

4. Leaves broader, ovate-lanceolate, 3–5 cm. in width, sharply serrate, reticulately veined, sparsely puberulent beneath; inflorescence loose, irregular; involucre 8 mm. high, campanulate; scales closely imbricated, acute, puberulent on the back. In dry ground, central Illinois: Urbana, *Gleason 2880*.

Distribution: From western Ohio west to southeastern Minnesota and eastern Nebraska, thence south into Indian Territory.

81. **Vernonia illinoensis** sp. nov.

Erect, simple or branching above, 10–15 dm. tall; stem usually purple, finely tomentose or pubescent; leaves spreading, firm, lanceolate or ovate-lanceolate, 6–15 cm. long, 1.5–4 cm. wide, long-acuminate, sharply and irregularly serrate, narrowed to a sessile base or short-petioled, dark-green and more or less scabrous above, paler and tomentose, or pubescent with ferruginous hairs beneath; inflorescence flattened or concave, 1–5 dm. across; peduncles tomentose; heads sessile and short-peduncled, 34–55-flowered; involucre broadly campanulate or hemispheric, 6 mm. high or rarely larger; scales all closely appressed, regularly imbricated, ovate to ovate-oblong, rounded, obtuse or rarely subacute at the tip, frequently mucronate, slightly pubescent or glabrous on the back, arachnoid-ciliate, the exposed portion purple; achenes furrowed, nearly glabrous, 4 mm. long; pappus purple or rarely tawny, 6–8 mm. long, the outer series frequently lighter in color.

Type: *Gleason 2865*, from Champaign, Illinois; in the herbarium of the New York Botanical Garden.

Distribution: Iowa, Illinois, Indiana, Michigan, Ontario and Ohio, following the eastern arm of the Prairie province.

Morphologically *V. illinoensis* stands very close to *V. missurica*, and extreme forms resemble that species so closely that they can not be distinguished from it by morphological structure alone.

On the other hand the typical form, extremely abundant on the prairies of central Illinois, is easily recognized from *V. missurica* by the smaller heads, the less tomentose leaves, the shorter involucre, the blunter, more arachnoid scales, and the purple pappus. The evidence from the geographical distribution of the two is alone sufficient to warrant the separation of the species. *V. missurica* is typically an Ozarkian plant, and no members of the Ozarkian flora have a range even approaching that of *V. illinoensis*. The latter is characteristic of the eastern arm of the Prairie province. Its distribution is therefore similar to that of *V. fasciculata*, and since it also somewhat resembles that species in the color of the scales and pappus, the sharper serration and the relatively little pubescence of the leaves, it seems probable that its affinities are with the group Fasciculatae rather than with the Interiores.

Specimens from Ontario have been distributed with the herbarium name *V. Macounii* Britton. They represent an extreme form with rather rugose, thinly pubescent leaves, and with reduced inflorescence, and should not be taken as a specific type, unless the form is eventually regarded as distinct from the western psilophyte.

(vi) Species-group *Interiores*

Heads large, 18–55-flowered; involucral scales appressed, at least at the base, spreading or recurved at the apex, usually acute or acuminate, more or less pubescent; pappus tawny or purple-tawny; leaves broad, serrate, tomentose beneath. The two species are characteristic of the Ozark region, and extend but little beyond its limits north into Iowa and south into Texas.

82. Vernonia interior Small, Bull. Torrey Club **27**: 279. 1900

Involucral scales greenish-purple, lanceolate, acute or short-acuminate, thinly canescent and ciliate, regularly imbricated, appressed at the base, the tips erect or very slightly spreading.

Type locality: "On plains and prairies, Missouri and Kansas south to Texas."

Distribution: from southeastern Nebraska and southern Iowa south to central Texas.

A well-marked species of little variability, except in the involucral scales. One sheet in the National Herbarium, *Crevecoeur 30*, from Onaga, Kansas, has few heads in a dense corymb, with

the narrow, long-acuminate, sharply serrate leaves of *V. fasciculata*, and may be a hybrid between the two species.

VERNONIA INTERIOR BALDWINI (Torr.) Mack. & Bush, Man. Fl. Jackson County 190. 1902

Vernonia Baldwini Torr. Ann. Lyc. Nat. Hist. 2: 211. 1827.
Vernonia sphaeroidea Nutt. Trans. Am. Phil. Soc. 7: 283. 1840.

Resembling the type, but with usually shorter involucre, more pubescent scales which are recurved at the tip, and frequently with shorter, proportionately broader leaves.

In dry soil, Missouri and southwestern Illinois, intergrading with the species.

83. VERNONIA MISSURICA Raf. Herb. Raf. 28. 1833

Vernonia fasciculata β T. & G. Fl. N. Am. 2: 58. 1841.
Vernonia altissima grandiflora A. Gray, Syn. Fl. 1²: 90. 1884.
Vernonia Drummondii Werner, Jour. Cin. Soc. Nat. Hist. 16: 171. 1894.
Vernonia interior Drummondii Mack. & Bush, Man. Fl. Jackson County 190. 1902.

Erect, 10–15 dm. high, branching above; stem stout, angled, gray-tomentose; leaves numerous, thick, spreading, sessile or short-petioled, lanceolate or ovate-lanceolate, 10–15 cm. long, 2–5 cm. wide, long-acuminate, sharply and coarsely serrate, acute or rounded at the base, scabrous above, tomentose beneath; inflorescence flattened, 2–5 dm. across; peduncles densely tomentose; heads sessile or short-peduncled, 34–55-flowered; involucre broadly campanulate or short-cylindric, 7–8 mm. high; scales regularly and closely imbricated, all appressed or rarely somewhat spreading, ovate or ovate-lanceolate, purple or greenish, rounded, obtuse, acute or mucronate, glabrous or puberulent on the back, more or less arachnoid-ciliate; achenes 4.5 mm. long, sharply ribbed, puberulent in the furrows; pappus 6–8 mm. long, tawny or rarely with a purple tinge, the outer series short but distinct.

Type locality: "In Missouri, barrens."

Distribution: Illinois, Missouri, Kansas, Arkansas, Indian Territory, and Texas, on prairies, barrens, and dry ground.

The species varies greatly in the shape of the involucral scales as well as in the color of the pappus, and extreme forms can scarcely be distinguished from *V. illinoensis*, except by the collection locality. *V. missurica* is typically an Ozarkian plant, and Tracy's *7334* from

southern Texas is the only sheet examined from far beyond the Ozarkian center.

(vii) Species-group *Altissimae*

Leaves lanceolate to ovate; inflorescence loose; heads 18–29-flowered; involucre rounded at base; scales closely and regularly imbricated. Three species of the Mississippi valley and the lower Appalachian mountains, extending south to the Gulf coast.

84. Vernonia ovalifolia T. & G. Fl. N. Am. 2: 59. 1841

Vernonia noveboracensis latifolia A. Gray, Syn. Fl. 1²: 89, partly. 1884.

Erect, 8–12 dm. high; stem glabrous or puberulent, simple or with a few branches below the inflorescence; leaves elliptic-oblong to lance-ovate, 8–10 cm. long, 2–5 cm. wide, acute or very short-acuminate, acute to obtuse or rounded at base, short-petioled, coarsely serrate, especially along the upper two-thirds, smooth or scabrous above, glabrous, pale and glaucescent, or a little puberulent on the veins beneath; upper leaves smaller, lanceolate or narrowly elliptic; inflorescence flattened, loose; heads sessile or short-peduncled, 18–21-flowered; involucre broadly campanulate, 5–6 mm. high; scales ovate or lance-ovate, ciliate, appressed at base, somewhat spreading at the short-acuminate cuspidate tips; achenes strongly furrowed, short-hirsute on the ribs, 3 mm. long; pappus tawny or rarely purplish, 6 mm. long, the outer series short but conspicuous.

Type locality: "Middle Florida, *Dr. Chapman!* also near Fort King, *Mr. Alden!*"

Distribution: from central Alabama through southern Georgia and into Florida.

Vernonia ovalifolia is another variable species, exhibiting marked differences in the foliage without affording any valid characters for separation of species. The preceding description is based on the type specimen from middle Florida and the following others: West Florida, *Chapman;* middle Florida, *Chapman 273;* Quincy, Florida, *Chapman;* Appalachicola, Florida, *Chapman;* Alabama, *Mc Carthy.* Harper's *1737*, from Cuthbert, Georgia, is also referred here, but differs slightly in the larger coarser leaves with less evident serrations. In addition the following forms require special mention:

2. Stem 4–6 dm. high; leaves small, lanceolate, 7 cm. long, 1.5 cm. wide, scabrous above, narrowed at base, with low sharp distant denticulations; inflorescence only 5–8 cm. across. The leaves are

not unlike the narrow upper leaves of the typical form. Auburn, Alabama, *Earle & Baker 769, 770.*

3. Leaves very broadly elliptic or ovate, narrowed below, sharply and coarsely serrate throughout, 8–9 cm. long, 4–5 cm. wide; the inner scales of the involucre often nearly acute. Auburn, Alabama, *Earle; Earle & Baker 1418.*

4. Leaves narrowly elliptic, acuminate, narrowed at base, sharply serrate with low teeth, scabrous above, more or less pubescent below, especially on the veins, 8–10 cm. long, 2–3 cm. wide; inflorescence large, very lax and irregular. Lee county, Georgia, *Harper 1075;* Auburn, Alabama, *Earle & Baker 774, 765; Earle 99; Pollard & Maxon 1.*

Inasmuch as *V. ovalifolia* is clearly related to *V. altissima* and to *V. flaccidifolia*, the typical form of the species, as here defined, is not that represented by the nomenclatorial type from Florida, but rather the fourth form described, growing in eastern Alabama and western Georgia.

85. Vernonia flaccidifolia Small, Bull. Torrey Club **25**: 144. 1898

Erect, 8–15 dm. high; stem glabrous; leaves lanceolate to ovate, 12–20 cm. long, 3–6 cm. wide, or rarely more narrowly lanceolate, acuminate, narrowed at the base into a margined petiole, sharply and saliently serrate, essentially glabrous on both sides; inflorescence flattened, loose, 1–3 dm. wide; heads about 21-flowered; involucre hemispheric, 3.5–4 mm. high; scales all appressed, regularly imbricated, glabrous, oblong-ovate, greenish or with a purple spot at the obtuse or subacute tip; pappus tawny, 6 mm. long.

Type locality: "On wooded hillsides, Ringgold, Georgia."

Distribution: the lower Appalachian region of Tennessee, South Carolina, Georgia and Alabama.

Related on the one side to *V. ovalifolia* and on the other to *V. altissima*, *V. flaccidifolia* is distinguished from either by its short, hemispheric involucre with glabrous, purple-tipped scales. It is without doubt the most definitely characterized species of the southeastern states, and is just as distinct from related forms as is *V. Lindheimeri* of the southwest.

86. Vernonia altissima Nutt. Gen. **2**: 134. 1818

Vernonia albiflora Raf. Herb. Raf. 29. 1833.

Vernonia gigantea Britton, Bull. Torrey Club **20**: 485, in part. 1893.

Vernonia maxima Small, Bull. Torrey Club **27**: 280. 1900.
Vernonia gigantea pubescens Morris, Proc. Biol. Soc. Washington **13**: 179. 1900.

Erect, 10–30 dm. high, frequently branched above; stem glabrous or nearly so; leaves narrowly elliptic, lanceolate or lance-ovate, 15–25 cm. long, 3–7 cm. wide, long-acuminate, attenuate at base, sharply and irregularly serrate or rarely nearly entire, glabrous or scabrellate above, glabrous or puberulent beneath; inflorescence flattened or concave, loose, 2–5 dm. across; heads 21–29-flowered; involucre campanulate, 4–5 mm. high; scales all appressed, regularly imbricated, ovate or oblong-ovate, sparingly ciliate, acute to obtuse or short-cuspidate at the tip; pappus purplish, 5–7 mm. long.

Type locality: "Near Savannah in Georgia, and throughout the States of Ohio and Kentucky, on the margins of streams and swamps."

Distribution: from western Pennsylvania to Missouri, south to Louisiana and Mississippi.

As might be expected in a species having such a wide distribution, there is considerable variation in the character and amount of foliage. One sheet from Missouri, *Mackenzie 93*, has firm leaves with the serration reduced and a tawny pappus. Some have leaves with salient teeth and smaller involucres, approaching *V. flaccidifolia*. One of these, *Tracy 8537*, has heads with as few as 15 flowers. A specimen from Westfield, Mississippi, has linear or narrowly lanceolate upper leaves which are nearly or quite entire. *Bush 1906* has smaller leaves, sparingly serrate with low teeth, broadest above the middle, scarcely acuminate, and a smaller inflorescence with dull-purple pappus.

The choice of the oldest valid name for the species is attended with some difficulty, and the introduction of an old name displaced in recent publications calls for an explanation. The solution of the question rests entirely on the identity of the *Vernonia altissima* of Nuttall. Until recent years this name has covered two species, the one here described and *V. gigantea* Britton. In the publication of the latter name Britton did not attempt to separate the two forms, but merely substituted Walter's old name, and indeed the particular collection which led to this nomenclatorial change was *V. altissima*. Gray was apparently the first to recognize two forms under the aggregate, when he mentioned in the Synoptical Flora the form *parviflora* "with involucre only 2 or 3 lines high

and rather pauciseriate." But Gray evidently did not consider those differences as of taxonomic importance. He further added that this form is Nuttall's original, and on that basis Small kept the name *altissima* as a synonym for *gigantea* and described the inland plant as *V. maxima*.

The essential difference between the two forms lies in the involucre, which in *V. gigantea* is less than half the height of the mature heads, subturbinate in shape, narrowed at the base, and with loosely imbricated, irregular scales. In the species under discussion it is at least half the height of the heads, broadly campanulate or nearly hemispheric in shape, rounded at the base, and with closely and regularly imbricated scales. Nuttall's original description of *V. altissima* agrees perfectly with the latter, " calix small and hemispherical, scales appressed, ovate, acute, ciliate, awnless," and "inner scales of the calix obtuse, without points, external merely acute, and with the points appressed." Elliott redescribed the plant and spoke also of the compact hemispheric involucre with closely appressed scales. It seems clear that Nuttall could have had no other plant in mind when formulating his description. There is nothing to indicate that the specimen referred to by Gray as Nuttall's original was taken by him as a type. In his description are the words "v. s. Anonymous, in Herb. Muhl." but the characters given must have been drawn instead from his field observations, and the Muhlenberg specimen was merely incorrectly referred to the same species.

The publication of a species by an intelligible description is just as valid as publication with reference to an earlier name, and if the accidental or incorrect citation of specimens is to take precedence over either then the name of this species would become *V. gigantea*, because that binomial was first applied to Kearney's *188* from Kentucky, or *V. albiflora* Raf., based on a white-flowered form.

(viii) Species-group *Giganteae*

Inflorescence usually very large and loose; heads 8–13-flowered; involucre short, narrowed at the base, and less than half the height of the mature head; scales loosely and irregularly imbricated, very variable in length. One species of the coastal plain of the South Atlantic states.

87. Vernonia gigantea (Walt.) Britton, Bull. Torrey Club **20**: 485. 1893

Chrysocoma gigantea Walt. Fl. Car. 196. 1788.

Vernonia altissima Lessing, Linnaea **6**: 639, partly. 1831. Not *V. altissima* Nutt.

Vernonia altissima parviflora A. Gray, Syn. Fl. 1²: 90. 1884.

Vernonia oligantha Greene, Pittonia **5**: 56. 1902.

Erect, branching above, with angled glabrous stems reaching a height of 2 m.; leaves scattered, lanceolate to elliptic, 10–20 cm. long, 1–6 cm. wide, acuminate, narrowed at the base into a short petiole, sharply serrate to nearly entire, glabrous or scabrellate along the margin above, glabrous or puberulent beneath; inflorescence usually very large, 2–4 dm. across, loose, irregular; heads sessile or peduncled, 8–13-flowered; involucre obpyramidal, 3–4 mm. high, less than half as high as the mature heads; scales loosely and irregularly imbricated in few series, all erect, oblong or oblong-lanceolate, acute or obtuse, glabrous or ciliate; achenes puberulent in the furrows, 3 mm. long; pappus dull-purple, 6 mm. long, the outer series usually lighter in color.

Type locality: "Carolina."

Distribution: South Carolina, Georgia and Florida, in swamps and wet places along the coastal plain.

Vernonia oligantha Greene, based on Tracy's *7339*, from Palmetto, Florida, and represented also by collections of Keeler at Neptune and Alden at Fort King, is apparently only a depauperate or shade form, with smaller proportionately wider leaves, and smaller inflorescence with fewer heads. The involucre is in all respects like the type.

Some specimens with narrow nearly entire leaves, such as *Harper 1936* from Baker County, Georgia, appear very different from the normal form in habit.

(ix) Species-group *Glaucae*

Leaves broad, usually rather abruptly narrowed at the base; heads many-flowered; scales acuminate into short filiform tips; pappus straw-colored. One species in the lower Appalachian mountain region.

88. Vernonia glauca (L.) Willd. Sp. Pl. **3**: 1633. 1804

Serratula glauca L. Sp. Pl. 818. 1753.

Vernonia noveboracensis latifolia A. Gray, Syn. Fl. 1²: 89, in part. 1884.

Vernonia noveboracensis tomentosa Britton, Ill. Fl. 3: 302. 1898.

Stem erect, glabrous or nearly so, 10–16 dm. high; leaves narrowly ovate-lanceolate or elliptic-oblanceolate to almost ovate, 10–25 cm. long, 2–10 cm. wide, short-acuminate, sharply and saliently dentate, abruptly narrowed at the base into a short margined petiole, glabrous or scabrellate above, paler and thinly pubescent beneath; inflorescence loose, flattened, 1–3 dm. wide; heads 34–47-flowered; involucre broadly campanulate or hemispheric, 6–7 mm. high; scales closely imbricated, glabrous or puberulent, lanceolate or triangular-ovate at the appressed base, acuminate, some or all with a filiform tip 2–5 mm. long; achenes prominently ribbed, nearly glabrous, 3.5 mm. long; pappus tawny or straw-colored, 6–7 mm. long.

Type locality: "in Marilandia, Virginia, Carolina."

Distribution: from southeastern Pennsylvania to Georgia and Alabama.

The species is distinguished at once by the characteristic and constant structure of the involucre and color of the pappus. There is, however, great variation in the foliage. Some plants have narrowly elliptic-oblanceolate leaves 2 by 10 cm., others broadly ovate leaves 5 by 13 cm., or even 10 by 25 cm. Both types are found throughout the range of the species.

Vernonia glauca Britton (Mem. Torrey Club 5: 311. 1894) is identical with *V. glauca* Willd., but *V. glauca* Britton, as used in the Illustrated Flora, refers to an entirely different plant, if indeed to any one definite plant at all. The involucral scales in the latter, as described, are similar in shape to those of *V. altissima*, but that species very rarely has less than 20 flowers in each head. The leaves resemble those of *V. ovalifolia*, but here the scales are different. Some plants of *V. flaccidifolia* have been distributed under this name, but the range as given in the Illustrated Flora extends too far north for that species, which also has about 21 flowers in the head.

(x) Species-group *Noveboracenses*

Tall species with thick stems, ample foliage, lanceolate leaves and wide inflorescence; heads many-flowered; scales all acuminately narrowed into spreading or recurved tips; pappus purple or tawny-purple. The two species are distributed along the Atlantic coastal plain from Massachusetts to Mississippi and inland to the Allegheny mountains.

89. VERNONIA NOVEBORACENSIS (L.) Michx. Fl. Bor. Am. 2: 95. 1803

Serratula noveboracensis L. Sp. Pl. 818. 1753.
Serratula praealta L. *l. c.*
Vernonia praealta Michx. *l. c.*
Chrysocoma tomentosa Walt. Fl. Car. 196. 1788.
Vernonia tomentosa Ell. Sk. 2: 288. 1824.
Vernonia noveboracensis tomentosa Britton, Mem. Torrey Club 5: 311. 1894.

Stem erect, 10–20 dm. tall, glabrous or thinly pubescent; leaves lanceolate, 10–18 cm. long, 1.5–4 cm. wide, acuminate, narrowed below, sessile or short-petioled, sharply serrate to nearly entire, glabrous or scabrellate above, puberulent or thinly tomentose beneath, especially on the veinlets; inflorescence flattened, loose, 1–3 dm. wide; heads sessile or short-peduncled, 29–47- (usually 34-) flowered; involucre campanulate, 6–7 mm. high; scales regularly and closely imbricated, glabrous or sparingly ciliate, ovate, rather abruptly tapering to a long filiform tip; achenes nearly glabrous, 4–4.5 mm. long; pappus purple or rarely tawny-purple, 6–7 mm. long.

Type locality: "in Noveboraco, Virginia, Carolina, Canada, Kamtschatca."

Distribution: Massachusetts to West Virginia and Mississippi, mostly near the coast.

The number of synonyms under the species name indicates to some extent the uncertainty which has characterized the treatment of *Vernonia noveboracensis* during the past hundred years. There is scarcely one of the large species of the central, eastern, or western states that has not at some time been confused with it. The plate and careful description of Dillenius in the Hortus Elthamensis make it perfectly clear to what form the Linnaean name applies. But Linnaeus also recognized another of Dillenius' species, *Serratula praealta*, differing from the type only in the shorter appendages of the involucral scales. The identity of this plant was in doubt for many years, until finally in 1829 Lessing showed its similarity to *V. noveboracensis*.

Walter's *Chrysocoma tomentosa* has been still more puzzling. His meagre description "herbacea, caule tripedali, foliis alternis lanceolatis dentatis subtus tomentosis," shows no essential difference from *V. noveboracensis*. Elliott, in transferring the species to the genus *Vernonia*, gave a fuller account, describing a plant with nar-

rowly lanceolate, sharply serrate leaves, tomentose and hoary beneath, and with the scale-tips "twice as long as those of any other species I have seen." Again, there is nothing to distinguish it from *V. noveboracensis*. It is also worthy of note that Elliott was not at all certain of the identity of his plant with that described by Walter. After seventy years Britton reduced it to a variety, but, strangely enough, his description in the Illustrated Flora and in the Manual refers mainly to *V. glauca*. After describing *V. noveboracensis* with leaves 5″–12″ wide he says for the variety: "Leaves * * * broader; * * * some scales sometimes merely acute," both characters directly at variance with Elliott's description, and agreeing scarcely better with Walter's. More recently E. S. Steele* has discussed the matter, and regards the name *V. tomentosa* Ell. as belonging to a hydrophile form of the south Atlantic coast, with linear-lanceolate leaves, sparsely and finely serrate and gray-tomentose beneath. In his opinion it is a distinct species. My own examination of the two sheets in the National Herbarium to which Steele referred disclosed no differences sufficient to warrant its separation. Small's distinction of a straw-colored pappus in *V. tomentosa* is not supported by herbarium evidence. Two sheets so labeled in the Columbia herbarium have immature heads which had not flowered, and the third, with tawny pappus, is clearly *V. glauca*.

90. **Vernonia Harperi** sp. nov.

Stem stout, erect, angled or striate, puberulent, simple below, divaricately branched above, 1 m. tall or higher; leaves numerous, thin, spreading or ascending, lanceolate, 12–18 cm. long, 1.6–3 cm. wide, acuminate, narrowed below into short petioles, sharply dentate with low ascending teeth, scabrous above, especially near the margin, the lateral veinlets prominent; upper and bracteal leaves smaller; inflorescence very large, 3 dm. across, very lax, open, irregular; heads long-peduncled to nearly sessile, 13–14 mm. high at maturity, with 55 flowers or more; involucre broadly campanulate, 7–9 mm. high exclusive of the awns; scales green, closely and regularly imbricated, appressed at the triangular-ovate base, arachnoid-ciliate, gradually tapering into erect awns barely equaling the pappus; achenes minutely pubescent on the ribs, 3.5 mm. long; pappus dull-purple, 6 mm. long, the outer series indistinct.

Type: *Harper 1424;* in the herbarium of the New York Botanical Garden.

Distribution: Coffee County, Georgia, *Harper 723, 1424.*

* Proc. Biol. Soc. Washington 14: 81–82. 1901.

Vernonia Harperi is distinguished from *V. noveboracensis* by the larger and looser inflorescence, the larger heads, the more numerous flowers, and by the greenish scales rather gradually narrowed at the tip.

(xi) Species-group *Pulchellae*

Leaves linear to broadly oblong, usually scabrous above; heads medium-sized, with 21 flowers or rarely more; scales acuminate or filiform. Coastal plain species of the southern Atlantic coast in the United States.

91. **Vernonia acaulis** (Walt.) nom. nov.

Chrysocoma acaulis Walt. Fl. Car. 196. 1788.
Vernonia oligophylla Michx. Fl. Bor. Am. **2**: 94. 1803.

Type locality: "in Carolina."

Distribution: North Carolina to Florida, in the coastal plain.

Michaux recognized two varieties, *verna* and *autumnalis*, based on minor details of the inflorescence of no taxonomic importance.

92. Vernonia pulchella Small, Bull. Torrey Club **25**: 145, 1898

Stem erect, simple to the inflorescence, leafy, pubescent, 4–7 dm. high; leaves oblong or oblong-lanceolate, 4–7 cm. long, 1–1.6 cm wide, acute, coarsely and irregularly toothed, rounded or subcordate at the sessile base, pinnately and reticulately veined, scabrous on both sides and with brown pubescence on the veins beneath; upper leaves narrower, acute at the base and nearly entire; inflorescence loose, depressed; heads peduncled or a few sessile, about 21-flowered; involucre campanulate, 5–7 mm. high; scales lanceolate, pubescent, loosely imbricated in few series, appressed below, acuminate into a recurved or spreading filiform tip; achenes 3 mm. long, strongly ribbed, hirsute on the angles; pappus tawny.

Type locality: "on sand-hills bordering the Altamaha River swamps in Liberty County, Georgia."

Distribution: South Carolina and Georgia.

93. **Vernonia recurva** sp. nov.

Stem erect, brown, pubescent below, glabrate above, striate, simple to the inflorescence, 7 dm. high; internodes short, about 1 cm. long below to 2 cm. above; leaves mostly near the base, firm, ascending, linear or oblong-linear, acute at the tip, rounded, closely sessile and somewhat dilated at base, revolute at the margin, with a few minute callous teeth, scabrous and puberulent above and be-

neath, pinnately veined with faint lateral veinlets; principal leaves 5-7 cm. long, 0.4–0.9 cm. wide, the upper leaves reduced to 2 cm. long, and 0.2 cm. wide, or those of the inflorescence still smaller; inflorescence terminal, open, loosely branching, 15 cm. across; heads about 20, all pedicelled, about 21-flowered, 11–12 mm. high at maturity; involucre 8 mm. high, campanulate-cylindric; scales dull-purple, the outer short, loose, linear, the intermediate and inner lanceolate and long-acuminate to oblong-lanceolate and abruptly acuminate, nearly glabrous, appressed at the base and ending in a loose, spreading or recurved, filiform appendage 3–6 mm. long; achenes strongly ribbed, minutely hispid on the angles, 3.5 mm. long; pappus twice as long, tawny, the outer series minute.

Type: *Harper 2009*, dry pine-barrens, Hortense, Wayne County, Georgia; in the herbarium of the New York Botanical Garden.

Vernonia recurva is distinguished from *V. scaberrima*, its nearest relative, by the narrower revolute leaves, the larger heads, the recurved scales, and the narrower involucre. From *V. pulchella* it is separated by the narrower leaves, which are merely denticulate and with the characteristically dilated base.

94. Vernonia scaberrima Nutt. Gen. 2: 134. 1818

Vernonia brevifolia Raf. New Fl. N. Am. 4: 77. 1836.
Vernonia angustifolia scaberrima A. Gray, Syn. Fl. 1^2: 91. 1884.

Erect, 3–6 dm. high, simple to the inflorescence or sparingly branched; stem glabrous or puberulent below, striate, leafy; leaves narrowly oblong, closely sessile, with a rounded to truncate or dilated base, acute or cuspidate, remotely denticulate, scabrous above, sparsely pubescent with scattered white hairs beneath, 2.5–7 cm. long, one fifth to one twelfth as wide; upper leaves gradually reduced; inflorescence loose, open, subumbellate; heads all pedunculed, 8–9 mm. high at maturity; involucre campanulate, 6–7 mm. high; scales all loosely imbricated, nearly glabrous or somewhat ciliate, lanceolate, long-acuminate into straight, erect or spreading tips; achenes hirsute, 2.5 mm. long; pappus tawny, about twice as long.

Type locality: "from South Carolina to Florida."

Distribution: North Carolina, South Carolina, Georgia and Florida.

(xii) Species-group *Angustifoliae*

Leaves usually linear or narrowly lanceolate and scabrous above; inflorescence regular, depressed or flattened; heads small, 13–21-flowered; scales acute to acuminate. Certain species disagree in

one or more of the preceding characters, but the general habit of the plants, coupled with their distribution, clearly indicates their relationship. All are coastal-plain species of the southern Atlantic coast of the United States, except one endemic in the Bahamas.

95. VERNONIA ANGUSTIFOLIA Michx. Fl. Bor. Am. 2: 94. 1803

Chrysocoma graminifolia Walt. Fl. Car. 196. 1788.

Vernonia graminifolia Mohr, Contrib. U. S. Nat. Herb. 6: 759. 1901.

Erect, 5–10 dm. high, simple to the inflorescence; stem striate, glabrous, pubescent or short-hirsute; leaves crowded, all narrowly linear, 5–10 cm. long, with revolute margins, scabrous above, sparingly pubescent beneath; inflorescence ample, rather compactly many-headed; involucre campanulate, 6 mm. high; scales glabrous or ciliate, lance-ovate, reddish or purple, appressed or the short-acuminate tips slightly spreading; achenes 2–3 mm. long, furrowed, pubescent; pappus purplish.

Type locality: "in aridis apricis sylvarum Carolinae."

Distribution: North Carolina, South Carolina, Georgia, Alabama, Florida, Mississippi.

There is considerable variation in foliage and involucre among the specimens examined. *Biltmore 3669*[a] has a narrowly cylindric involucre and tawny pappus, but is otherwise like the type. *Earle & Earle 98* from Auburn, Alabama, has the lower leaves flat, over a centimeter wide and saliently toothed. The upper leaves are linear and revolute. Others from the same place, like *Earle & Baker 1171*, have lanceolate or narrowly elliptic, entire leaves, sometimes 1 cm. across. They are a little revolute, and since the plant differs from the type in no other way it may be regarded as a mesophytic or shade form of the species.

Although the oldest specific name for the species is Walter's *graminifolia*, the use of the binomial *V. graminifolia* Mohr is antedated by *V. graminifolia* Gardner, applied in 1847 to a Brazilian species.

96. **Vernonia dissimilis** sp. nov.

Stem stout, thick, erect, 8–11 dm. high, strongly striate, glabrous above, pubescent or short-hirsute below; leaves numerous, firm, spreading or ascending, sessile, narrowly lanceolate, 10–15 cm. long, 1–2 cm. wide, acuminate at both ends, sharply serrate, not revolute, scabrous above, especially at the margins, sparsely pubescent with short white hairs beneath, pinnately veined with conspicuous lateral veinlets; upper leaves gradually reduced in size,

nearly entire; inflorescence terminal, flattened, rather dense; heads about 21-flowered, 8 mm. high at maturity, sessile or on pedicels seldom over 1.5 cm. long; involucre campanulate, 4 mm. high; scales closely imbricated in few series, all appressed, ovate-lanceolate, strongly arachnoid-ciliate, obtuse, subacute, or the outer sharply acute, exposed portions dark-red; achenes sharply and prominently ribbed, hirsute on the angles and somewhat resinous, 2.5 mm. long; pappus 5 mm. long, bright-purple, the outer series inconspicuous.

Type: *Earle & Baker 1189*, from Auburn, Alabama; in the herbarium of the New York Botanical Garden.

The species is closely related to *V. angustifolia*, from which it is distinguished by the taller and coarser habit, the broad, flat, serrate leaves, the proportionately smaller and more irregular corymb, the arachnoid involucre, the blunt scales and the more brightly colored pappus. In general habit and gross appearance, so far as can be shown by herbarium sheets, the two are entirely distinct. It is to be regretted that no notes are available on its ecology, since both species live together in the same county.

97. Vernonia concinna sp. nov.

Stem apparently erect, simple, striate, green, glabrous, 8 dm. high; leaves numerous, thin, divaricate, oblong-linear or narrowly oblanceolate, flat, entire or with minute callous teeth, acute, narrowed to a sessile base, bright-green and glabrous above, paler beneath and sparsely pubescent with short white hairs, the principal leaves 10–12 cm. long, 0.8–1.2 cm. wide, the upper somewhat reduced; inflorescence loose, subumbellate, flattened, 1 dm. across, resembling that of *V. angustifolia;* heads about 13-flowered, 1 cm. high at maturity; involucre campanulate-turbinate, 6–7 mm. high; scales rather loosely imbricated in few series, glabrous or a little ciliate, triangular-acute or mucronate, the inner oblong-lanceolate, the outer narrower, the basal slightly spreading; achenes minutely pubescent, 3 mm. long; pappus purplish-tawny, 5–6 mm. long.

Type: *Nash 1759*, from Eustis, Lake county, Florida; in the herbarium of Columbia University. The same collection is in the National Herbarium, numbered 223166.

Vernonia concinna is also closely related to *V. angustifolia*, as is shown by the shape of the involucre and character of the inflorescence, as well as by its geographical distribution. It is abundantly different in the smooth, flat, lax leaves and the acute scales. Some forms of the latter species resemble *V. concinna* in the shape of the leaves, such as *Earle & Baker 1171* already mentioned, but they invariably have acuminate scales and scabrous leaves, some or all of which are revolute.

98. Vernonia Blodgettii Small, Fl. S. U. S. 1160. 1903

Vernonia angustifolia pumila Chapman, Bot. Gaz. 3: 5. 1878.

Stem slender, erect, faintly striate, glabrous or nearly so, simple or branching from the base, 2–6 dm. high; leaves numerous and crowded below, few and scattered above, the largest at or near the base of the stem, spreading or ascending, firm, linear or narrowly lanceolate, 4–8 cm. long, 3–6 mm. wide, obtuse or acute, entire or minutely denticulate, glabrous above, very sparsely short-pubescent beneath; upper leaves much smaller; inflorescence loose, irregular; heads all peduncled, about 21-flowered, 8 mm. high at maturity; involucre broadly campanulate or hemispheric, 5 mm. high; scales few, appressed, very loosely and irregularly imbricated, lanceolate, acute or subacute, glabrous or nearly so, the exposed portion red or purple; achenes 2.5 mm. long, sharply ribbed, pubescent in the furrows; pappus yellow, twice as long as the achenes.

Type locality: Pine Key, Florida.

Distribution: Florida.

Of the seven sheets in the herbarium of the New York Botanical Garden four have the narrow leaves and acute scales of the type, as characterized above. The other three, *Small & Wilson 1878*, *Curtiss*, and *Small & Carter 771*, have the lower leaves obtuse or even rounded at the apex, much broader and shorter, the length being only three to six times the width, and the scales sharply mucronate or even acuminate. Additional field study may prove this to be a distinct species.

The use of Chapman's varietal name for the species is prevented by the publication of the name *V. pumila* for an African species.

99. Vernonia insularis Gleason, Bull. Torrey Club 33: 184. 1906

Perennial by a horizontal rootstock; stem herbaceous or suffruticose, glabrous or minutely puberulent in the inflorescence, erect, 6–10 dm. high, simple or sparingly branched; leaves numerous, narrowly oblong-linear, 6–10 cm. long, 0.8–1.2 mm. wide, obtuse or subacute, mucronate, entire, acute or narrowed at the sessile base, one-nerved or with faint lateral veinlets, green and essentially glabrous on both sides, the upper somewhat smaller; inflorescence terminal, cymose, lax; heads 4–25, on peduncles 0.5–4 cm. long; involucre at maturity broadly campanulate or depressed-hemispheric, about 5 mm. high; scales glabrous with membranous margins, the outer lanceolate, sharply acuminate, the inner oblong, abruptly acuminate or mucronate; achenes 2 mm. long, striate, sparsely pubescent; pappus tawny, 6 mm. long, the outer series minute.

Type locality and distribution: Bahama Islands.

Uncertain or Excluded Species

Vernonia Achyrocoma Lessing, Linnaea 4: 313. 1829. (*Achyrocoma tomentosa* Cass. Dict. Sci. Nat. 26: 21. 1823.)

Vernonia aristata (Cass.) Lessing, Linnaea 4: 313. 1829. (*Lepidaploa aristata* Cass. Dict. Sci. Nat. 26: 17. 1823.)

Vernonia hypoleuca DC. Prodr. 5: 27. 1836. Differs from all known North American species in having opposite three-nerved and three-lobed leaves, and probably does not belong in the *Vernonieae*.

Vernonia inuloides DC. Prodr. 5: 62. 1836.

Vernonia profuga DeNot. Ind. Sem. Hort. Genuen. 1840.

Vernonia toluccana DC. Prodr. 5: 30. 1836. A form with opposite leaves and peculiar inflorescence, probably not belonging to the *Vernonieae*.

8. EREMOSIS (DC.) gen. nov.

Turpinia La Llave & Lex. Nov. Veg. Desc. 1: 22. 1824. Not *Turpinia* Humb. & Bonpl.

Monosis § *Eremosis* DC. Prodr. 5: 77. 1836.

? *Llerasia* Triana, Ann. Sci. Nat. IV. 9: 37. 1858.

? *Critoniopsis* Sch.-Bip. Pollichia 20–21: 430. 1863.

Heads 1–3-flowered, or rarely 5-flowered; involucre cylindric or narrowly turbinate, the innermost scales frequently deciduous with the achenes; receptacle subconvex; corollas tubular, regularly 5-cleft; anthers, stigmas, achenes and pappus as in *Vernonia*. Shrubs and small trees, freely branching and usually more or less tomentose; leaves pinnately veined, entire or denticulate; heads aggregated in close round-topped corymbose clusters terminating the branches and forming a compound panicle.

Type, *Monosis salicifolia* DC.

An American genus, related on the one hand to *Vernonia*, from which it is separated by the character of the inflorescence and the number of flowers in the head, and on the other to *Oliganthes*, from which it differs in the capillary pappus.

* Heads 1-flowered or rarely 2-flowered.

Leaves of a broad type, their width at least half their length, very abruptly short-acuminate; scales of the involucre acute, with the midvein prolonged into a conspicuous mucro. 1. *E. foliosa*.

Leaves essentially as above, acute or acutish at both ends; all scales pale-brown or straw-colored, rounded or subacute at the apex, not mucronate. 2. *E. pallens*.

Leaves of an oblong or lanceolate type, at least 2.5 times as long as wide (except in *E. Steetzii*); scales acute or subacute, not mucronate.

Leaves densely tomentose beneath.
Leaves oblong, rounded at base, 2–4 cm. wide.
3. *E. tomentosa.*
Leaves narrowly elliptic, tapering at the base.
4. *E. tarchonanthifolia.*
Leaves glabrous or sparsely hairy below.
Leaves ovate, 3 cm. wide or more. 5. *E. Steetzii.*
Leaves elliptic, 2 cm. wide or less.
Leaves glabrous beneath; involucre light-brown; scales glabrous at the tip. 6. *E. leiophylla.*
Leaves pubescent beneath, especially in the axils of the veins; involucre purplish; scales more or less tomentose at the tip.
7. *E. salicifolia.*
** Heads 3-flowered; inner scales deciduous.
Leaves pilose on the veins beneath. 8. *E. barbinervis.*
Leaves densely tomentose beneath.
Scales densely tomentose, greenish or gray.
Achenes light-brown. 9. *E. leiocarpa.*
Achenes dark-purple or nearly black. 10. *E. melanocarpa.*
Scales nearly glabrous, purplish. 11. *E. Palmeri.*
Scales glabrous above, tomentose at the base. 12. *E. purpurascens.*
Leaves glabrous or thinly pubescent beneath.
Leaves 2.5 cm. wide or less. 13. *E. trifloscula.*
Leaves 4 cm. wide or more. 14. *E. Heydeana.*
*** Heads 5-flowered. 15. *E. Shannoni.*

1. **Eremosis foliosa** (Benth.) nom. nov.

Monosis foliosa Benth. Pl. Hartweg. 19. 1839.
Vernonia foliosa Sch.-Bip. Pollichia **18–19**: 161. 1861. Not *V. foliosa* Gardn. 1846.

Low shrub; branches finely tomentose, becoming glabrate with age; leaves broadly ovate or elliptic-ovate, 4–7 cm. long, 1.5–3 cm. wide, abruptly short-acuminate, entire or with a few scattered teeth, acute to subcordate at base, thinly tomentose on both sides or becoming glabrous above; involucre 5 mm. high; outer scales short, triangular-ovate, thinly tomentose, the inner lanceolate, glabrous or puberulent, purple, tipped with a mucro 0.5 mm. long; achenes villous; pappus white, the inner series 7–8 mm. long.

Type locality: "to the north of the town of Mexico."

Distribution: central and southern Mexico.

2. **Eremosis pallens** (Sch.-Bip.) nom. nov.

Vernonia pallens Sch.-Bip. Pollichia **18-19**: 161. 1861.

Shrubby, with terete or faintly striate glabrous branches; leaves numerous, elliptic, entire, acute at both ends, glabrous on both sides,

4–5 cm. long, 1.1–1.8 cm. wide, with glabrous petioles 3–4 mm. long; heads almost sessile or with short peduncles 1–2 mm. long; involucre narrowly turbinate, 5 mm. high, pale-brown; the outer scales ovate, the inner oblong, all glabrous and rounded or subacute at the tip, not mucronate; achenes 2.5 mm. long, sparsely villous with short hairs; pappus white, 7 mm. long, the inconspicuous outer series less than half as long.

Type locality and distribution: Mexico.

The single specimen examined is from the Meisner herbarium and is labeled "*Monosis parviflora* Bartl. Mexico. Ex. Mus. Bot. Götting. Com. cl. Bartling, 1838."

Eremosis pallens and *E. foliosa* constitute a natural group, resembling each other in general habit and in the shape of the leaves. Of the two *E. pallens* approaches most nearly the remaining members of the genus.

3. **Eremosis tomentosa** (La Llave & Lex.) nom. nov.

Turpinia tomentosa La Llave & Lex. Nov. Veg. Desc. **1**: 22. 1824.

Monosis tomentosa DC. Prodr. **5**: 77. 1836.

Vernonia Monosis Sch.-Bip. Linnaea **20**: 507. 1847.

? *Vernonia paniculata* DC. Prodr. **5**: 23. 1836.

Shrubby, the stem, branches, pedicels, petioles and lower surface of the leaves covered with a close dense gray tomentum; leaves oblong or oblong-ovate, 8–12 cm. long, 4–5 cm. wide, glabrous or minutely puberulent above, entire, acute, abruptly narrowed to truncate at the base; inflorescence hemispheric, terminating all the upper branches and forming a huge leafy pyramidal panicle 2–4 dm. long and 1–3 dm. wide; heads sessile or on short peduncles; involucre cylindric, 5–6 mm. high; outer scales ovate, acute, tomentose, the inner oblong, acute, glabrous, or pubescent at the apex and margin, the exposed portion purple; achenes 3 mm. long, villous with erect hairs; pappus white, the inner series 6–7 mm. long.

Type locality: "habitat in monte excelso de Quinzeo prope Vallisoletum."

Distribution: central and southern Mexico.

This species is well represented in American herbaria and the following more recent collections are referred to it: *Pringle 2439*, *Seler 1751*, *Dugès 476a*, *Conzatti 117*. It has usually been distributed as *Vernonia paniculata* DC., which, in fact, it may be. De Candolle's description is incomplete, since he saw neither

flowers nor fruit. Bentham, in Plantae Hartwegianae, intimates that they are the same, and Hemsley has more recently used the same name for the species. The use of the older name of La Llave and Lexarza is based on *Hartweg 132*, cited by Bentham, a specimen of which is in the Gray Herbarium.

4. Eremosis tarchonanthifolia (DC.) nom. nov.

Monosis tarchonanthifolia DC. Prodr. **5**: 77. 1836.
Oliganthes Karwinskii Sch.-Bip. Linnaea **20**: 505. 1847.
Vernonia tarchonanthifolia Sch.-Bip. Linnaea **20**: 507. 1847.

A shrub 3–6 m. high, with terete branches covered when young with a close gray tomentum, becoming thin or disappearing entirely with age; leaves lanceolate or elliptic-lanceolate, 5–8 cm. long, 1.5–2 cm. wide, short-acuminate or acute at the apex, narrowed below to petioles 4–6 mm. long, entire or minutely and remotely denticulate, glabrous above, finely gray-tomentose beneath and on the petioles; inflorescence pyramidal or hemispheric, 5–10 cm. across, the branches tomentose; heads crowded, sessile or on very short peduncles; involucre cylindric to narrowly turbinate, 5–6 mm. high; outer scales triangular-ovate; inner scales longer with triangular tips, acute or obtuse, purplish, with a little tomentum near the tip; achenes villous, 2.5 mm. long; pappus yellowish-white, the inner series 7 mm. long, the outer 1 mm.

Type locality: "in Mexico."

Distribution: southern Mexico, *Pringle 5842, 6166; Smith 314, 366; Conzatti & González 554.*

Eremosis tarchonanthifolia is easily distinguished from the other members of the genus by its narrow elliptic leaves conspicuously covered below with gray tomentum. In most of the specimens examined the heads are 2-flowered, a peculiarity not observed in any of the others, and at maturity the inner scales are somewhat deciduous.

5. Eremosis Steetzii (Sch.-Bip.) nom. nov.

Vernonia Steetzii Sch.-Bip.; Seemann, Bot. Voy. Herald 297. 1856.

Shrubby, the branches obscurely ribbed, puberulent; leaves ovate, obtuse or rounded, or somewhat attenuate below, short-acuminate at the apex, denticulate with short callous teeth, minutely puberulent above, sparsely pubescent beneath, especially along the veins, 6–8 cm. long, 3–4 cm. wide; those in the inflorescence smaller, ovate-lanceolate or elliptic-ovate; inflorescence forming a hemispheric leafy panicle; heads on peduncles 1–3 mm. long;

involucre about 6 mm. high, pale-brown, lightly suffused with purple; scales all acute or short-acuminate, glabrous or nearly so; achenes densely villous with ascending hairs, 2–5 mm. long; pappus white, the inner series 6–7 mm. long, the outer much shorter.

Type locality: Sierra Madre, Mexico.

Distribution: northwestern Mexico, *Seemann; Palmer 273*.

Eremosis Steetzii callilepis (Sch.-Bip.) nom. nov.

Vernonia Steetzii callilepis Sch.-Bip. *l. c.*

Described by Schultz as follows: "foliis duplo minoribus, paulo longis petiolatis, involucri squamis non tam caducis, purpurascentibus. An spec. distincta?" Type locality the same as for the species.

6. Eremosis leiophylla sp. nov.

A shrub 3.4–5 m. high, with glabrous branches and foliage; branches brown, faintly ribbed; leaves numerous, oblong or elliptic-oblong, acute at both ends, entire, or with a few minute callous teeth, 3–4 cm. long, 1–1.5 cm. wide; petioles 3–4 mm. long; inflorescence terminating the branches, in hemispheric clusters 5–6 cm. across, aggregated to a large compound panicle, glabrous except for a little pubescence on the pedicels; heads sessile or short-peduncled, 1-flowered; involucre pale-brown, 5-6 mm. high; scales glabrous or minutely ciliate, acute, the outer ovate, the inner oblong, acute; corolla purplish; achenes short-villous, 2.5–3 mm. long; pappus white, 7–8 mm. long, the bristles of the outer series uneven, much shorter.

Type: *Pringle 6188*, collected November 5, 1895, on the mountains above Cuernavaca, state of Morelos; in the herbarium of Columbia University.

The species is distinguished from all other members of the group by its almost entire lack of pubescence. The size and shape of the leaves is also characteristic.

7. Eremosis salicifolia (DC.) nom. nov.

Monosis salicifolia DC. Prodr. **5**: 77. 1836.
Vernonia uniflora Sch.-Bip. Linnaea **20**: 506. 1847.
V. salicifolia Sch.-Bip. *l. c.* 507.

Shrubby; branches terete, covered with a thin gray arachnoid tomentum; leaves narrowly oblong-lanceolate or elliptic-lanceolate, typically 4–8 cm. long by 1–2 cm. wide, acute or subacute at the apex, entire or slightly undulate, punctate with resinous glands, glabrous or thinly tomentose on both sides, tapering below into petioles 4–6 mm. long; lateral veins ascending, with tufts of brown

tomentum in their axils; heads on peduncles 1–3 mm. long; involucre cylindric, 6 mm. high; scales in 3–4 series, ovate to oblong, acute or subacute, purplish, the outer thinly tomentose, the inner glabrous except for a tuft of tomentum at the tip; achenes 2.5 mm. long, villous, ribbed; pappus nearly white, the inner series 6 mm. long, the outer inconspicuous, 2 mm. long.

Type locality: "in Mexici montibus ad Guchinapa et Cuernavaca."

Distribution: central and southern Mexico.

8. **Eremosis barbinervis** (Sch.-Bip.) nom. nov.

Vernonia barbinervis Sch.-Bip.; Seemann, Bot. Voy. Herald 297. 1856.

Stem strongly angled, nearly glabrous; leaves broadly elliptic, 9–12 cm. long, 4–5 cm. wide, obtuse or subacute, entire, narrowed at the base, nearly glabrous above, densely tomentose along the midvein beneath; inflorescence hemispheric; involucre narrowly campanulate, 7 mm. high, its scales ovate to oblong, acute, scarious, ciliate.

Type locality: Sierra Madre, Mexico.

Distribution: northwestern Mexico, *Seemann*.

9. **Eremosis leiocarpa** (DC.) nom. nov.

Vernonia leiocarpa DC. Prodr. **5**: 34. 1836.

Frutescent; branches terete, tomentose when young, glabrate with age; leaves ovate-lanceolate to ovate, 8–14 cm. long, 2–6 cm. wide, acute, entire or dentate, narrowed at base, pulverulent or nearly glabrous above, densely cinereous-tomentose below; petioles 1.5 cm. long; inflorescence large, leafy-bracted; heads very numerous, densely aggregated, sessile or minutely pedunculate; involucre cylindric or narrowly campanulate, 5–6 mm. long, but becoming shorter by the loss of the inner scales; outer scales broadly triangular-ovate, obtuse, densely tomentose, the inner becoming oblong, with the arachnoid tomentum only on the obtuse tips; achenes 2.5–3 mm. long, glabrous, pale-brown, faintly striate; pappus white, 6–7 mm. long.

Type locality: "in Mexico."

Distribution: the mountains of southern Mexico and Guatemala.

10. **Eremosis melanocarpa** sp. nov.

Frutescent, height unknown; branches terete, densely tomentose when young, becoming thinly tomentose or glabrate with age; leaves ovate or ovate-lanceolate, about 10 cm. long, 4 cm. wide, entire or obscurely toothed, acute or acuminate, narrowed at base, scabrous-pubescent or thinly tomentose above, densely cinereous-

tomentose beneath, especially along the veins, where the hairs are brown in color; petioles 1.5–2.5 cm. long; inflorescence pyramidal, dense; heads closely aggregated, sessile or nearly so; involucre narrowly campanulate, 3–4 mm. long; scales all obtuse or rounded, the outer broadly ovate or triangular, densely tomentose, the inner broadly oblong, tomentose at the apex and margin; achenes 2.5 mm. long, glabrous, dilated above, dark-purple or almost black; pappus white, 5 mm. long.

Type: *Heyde & Lux 3416*, from Depart. Santa Rosa, Guatemala; in the herbarium of Columbia University. Other specimens referred here are *Maxon & Hay 3594*, from Guatemala, and *Seler 2127*, from Chiapas, Mexico.

Closely related to *E. leiocarpa*, from which it is separated by the denser and more abundant tomentum and the character of the achenes.

11. Eremosis Palmeri (Rose) nom. nov.

Vernonia Palmeri Rose, Contr. U. S. Nat. Herb. **1**: 101. 1891

A bush with many stems, 1–1.5 m. high, closely sericeous-pubescent, the old wood becoming glabrous; leaves lanceolate, 7–16 cm. long, 2–3 cm. wide, entire, or sometimes remotely serrulate, somewhat pubescent above, densely so beneath; inflorescence forming large pyramidal clusters; heads short-peduncled; involucre cylindric or narrowly campanulate, 5 mm. high; scales loosely imbricated, the outer broadly triangular, pubescent, the inner progressively longer, scarious, glabrous, acute, with a prominent midvein; achenes (immature) pubescent; pappus white, 4 mm. long.

Type locality: "Alamos."

Distribution: northwestern Mexico, *Palmer 387* (type).

The amount of pubescence on the leaves seems to be variable and specimens with relatively little are quite similar to *E. trifloscula*.

12. Eremosis purpurascens (Sch.-Bip.) nom. nov.

Vernonia purpurascens Sch.-Bip.; Walp. Rep. **2**: 945. 1843.
? *Vernonia paniculata* DC. Prodr. **5**: 23. 1836.

Type locality: "ad St. Pedro Nolasco in provincia Oaxaca."

No specimens have been seen which could be referred to this species. Schultz's description is almost identical with that of *V. paniculata*.

13. Eremosis trifloscula (H.B.K.) nom. nov.

Vernonia trifloscula H.B.K. Nov. Gen. **4**: 40. 1818.
Gymnanthemum congestum Cass. Dict. Sci. Nat. **20**: 110. 1821.

Vernonia triantha Schauer, Linnaea **19**: 714. 1847.
Vernonia luxensis Coulter, Bot. Gaz. **20**: 41. 1895.
Vernonia dumeta Klatt, Bull. Soc. Roy. Bot. Belg. **35**: 277. 1896.

Shrubby or arborescent, 3 m. high; branches striate, thinly pubescent or glabrescent; leaves rather numerous, oblanceolate to elliptic, tapering at base, acute, entire or nearly so, 8–12 cm. long, 1.5–3 cm. wide, green above, paler below, essentially glabrous on both sides, the midvein prominent; inflorescence conic or hemispheric, the heads very numerous, aggregated by twos and threes on short peduncles; involucre cylindric, 4–5 mm. high; scales loosely imbricated, the outer subrotund or ovate, the inner oblong, all scarious, acute, glabrous or nearly so on the back, minutely ciliate; achenes 3 mm. long, pubescent; pappus white, 5 mm. long.

Type locality: "crescit in montibus Mexicanis prope Acaguisotla, alt. 500 hex."

Distribution: from southern Mexico to Costa Rica.

14. **Eremosis Heydeana** (Coulter) nom. nov.

Vernonia Heydeana Coulter, Bot. Gaz. **20**: 42. 1895.

Stem woody, striate, puberulent or glabrate; leaves elliptic or ovate, 8–10 cm. long, 4.5–6 cm. wide, acute, entire or remotely denticulate, acute at the base, very sparsely pubescent above, thinly tomentose beneath or glabrescent with age; inflorescence hemispheric to pyramidal, crowded; involucre narrowly campanulate, 6 mm. high; scales ovate to oblong-ovate, obtuse, ciliate; achenes glabrous or minutely glandular, 3 mm. long; pappus white.

Type locality: San Miguel, Uspantán, Depart. Quiché, Guatemala.

Distribution: Guatemala, *Heyde & Lux 3392* (type), and Mexico, *Smith 371*.

The original description indicates 6-flowered heads, but all those examined have three flowers. The broad, ovate leaves are the most characteristic feature of the species.

15. **Eremosis Shannoni** (Coulter) nom. nov.

Vernonia Shannoni Coulter, Bot. Gaz. **20**: 42. 1895.

"Leaves long-oval, taper-pointed at each end, petioled, entire, glabrous, heads 5-flowered, somewhat closely corymbose and pedicellate: involucral scales in five or six rows, the inner ones elongated-oblong and obtuse, the outer * * * broadly ovate and acutish, * * * achenes glabrous."

Specimens of this species have not been examined, but the scanty description corresponds so closely with the generic characters of *Eremosis* that it is included here.

Type locality: Depart. San Márcos, alt. 9191 ft.

9. OLIGANTHES Cass. Bull. Soc. Philom. 1817: 10. 1817; 1818: 58. 1818

Dialesta H.B.K. Nov. Gen. 4: 44. 1818.

Heads 1–8-flowered, aggregated in dense corymbiform panicles terminating the stem and branches; involucre cylindric or narrowly campanulate; scales membranous or scarious; receptacle subconvex; corolla regular, the limb deeply 5-cleft; anthers sagittate, obtuse at the base; achenes ribbed; pappus typically in two series, the inner or both sometimes caducous, of linear flat scales, which are twisted towards the apex. Shrubs or small trees, with usually broad tomentose leaves and dense panicles resembling those of *Eremosis*.

Type, *O. triflora* Cass.

A genus of tropical America, containing several species which vary greatly in the structure of the pappus and which were formerly included in five different genera. As limited by Bentham and Hooker the genus is too close to *Piptocoma*.

Heads 1-flowered.	1. *O. discolor.*
Heads 8-flowered.	2. *O. oxylepis.*

1. OLIGANTHES DISCOLOR (H.B.K.) Sch.-Bip. Linnaea 20: 502. 1847

Dialesta discolor H.B.K. Nov. Gen. 4: 45. 1818.

Stem closely cinereous; leaves ovate-lanceolate, 10 cm. long, 5 cm. wide, acuminate, entire, narrowed at the base, rugose and glabrate above, tomentulose beneath, especially on the veins, and with numerous short hairs; heads 1-flowered, densely aggregated on peduncles 5 mm. long; involucre 5 mm. high; scales curved, appressed, ciliate, glabrous on the back or the outer tomentose, the outer obtuse, ovate, the inner oblong, acute; achenes glabrous, 1.5 mm. long; outer pappus of about 5 short ovate fimbrillate scales, the inner of flat twisted scales 2.5 mm. long.

Type locality: "in calidis prope Honda Novo-Granatensium."

Distribution: Costa Rica, *Pittier 4910*, south to Colombia.

2. OLIGANTHES OXYLEPIS Benth.; Benth. & Hook. Gen. Pl. 2: 233. 1873

Heads 8-flowered; leaves dentate. No specimens seen.

Type locality: Yucatan.

10. PIPTOCOMA Cass. Bull. Soc. Philom. 1817: 10. 1817

Heads about 8–11-flowered; involucre campanulate; scales imbricated in several series; receptacle flat; corollas regularly 5-cleft; anthers sagittate, obtuse at the base; achenes 5-angled; pappus double, the outer of short scales, the inner of elongate, linear, somewhat twisted, caducous scales. Shrubby; heads in terminal corymbiform clusters; leaves ferruginous-tomentose beneath.

A monotypic genus of Hispaniola, Porto Rico, and St. Thomas, closely related to *Oliganthes*, from which it differs in the many-flowered heads which are somewhat larger and less closely aggregated than in that genus. Schultz did not consider these differences sufficient to warrant their separation, and united the two under the name *Oliganthes*.

PIPTOCOMA RUFESCENS Cass. *l. c.* 1817

Eupatorium domingense Sprengel, Syst. Veg. 3: 412. 1826.
Oliganthes rufescens Sch.-Bip. Pollichia 20–21: 338. 1863.

Shrubby, freely branching; stems angled, thinly cinereous or canescent, the young shoots strongly angled and ferruginous; leaves lanceolate-oblong, obtuse, narrowed at the base, 4–5 cm. long, 1–1.5 cm. wide, green and finely stellate-pubescent above, reticulately veined and densely ferruginous beneath; petioles 3 mm. long; involucre 4 mm. high, its scales closely imbricated, ovate, obtuse, all tomentose, the inner at the apex only; achenes nearly glabrous, 2 mm. long; pappus yellowish-white, 5 mm. long.

Type locality: Hispaniola.

Distribution: Hispaniola, Porto Rico and St. Thomas.

11. BOLANOSA A. Gray, Pl. Wright. 1: 82. 1852

Heads large, many-flowered, 1–2 cm. across, single, or 2–5 in dense corymbs, terminating the stem or branches; involucre broadly hemispheric, the scales imbricated in several series, the outer gradually shorter; receptacle flat, bearing oblong, conduplicate, scarious scales 6–8 mm. long; corolla regular, 5-cleft; achenes irregularly angled, obtusely 10-ribbed, turbinate, truncate; pappus in two series, the outer of short flat linear acuminate scales, the inner of long linear scales. Floccose or tomentose herbs; leaves alternate, sessile.

A monotypic genus of western Mexico.

BOLANOSA COULTERI A. Gray. *l. c.*

Stem erect, leafy, simple to the inflorescence or with a few branches in the axils above, floccose with white wool, becoming glabrous below; leaves ovate-lanceolate to narrowly elliptic-

oblong, 5–10 cm. long, 1.5–3 cm. wide, remotely denticulate, acute, narrowed to a subsessile base, glabrous above, or floccose when young, densely fulvous-tomentose beneath; the upper leaves gradually reduced to 2–3 cm. in length; involucre white-floccose; scales oblong-lanceolate, the inner glabrous and colored red at the tip; chaff of the receptacle narrowly oblong; achenes 3 mm. long, densely hirsute with ascending white hairs; pappus white, the bristles slightly ciliate, the outer series 4 mm., the inner 9 mm. long.

Type locality: "Bolanos, northern Mexico."

Distribution: Jalisco, western Mexico.

12. STOKESIA L'Herit. Sert. Angl. 16. 1788

Heads many-flowered, on terminal peduncles; involucre depressed-hemispheric, its scales imbricated in several series, the outer with foliaceous spreading tips, the inner membranous, appressed; corolla 5-cleft, the central ones nearly regular, the marginal ones much larger and appearing ligulate; achenes 3–4-angled, truncate; pappus of 4–5 narrow caducous scales. Herbaceous perennial with leafy stem; leaves alternate, the lower petioled, the upper sessile and clasping; heads large; corollas blue.

A monotypic genus of the southeastern United States.

STOKESIA LAEVIS (Hill) Greene, Erythea 1: 3. 1893

Carthamus laevis Hill, Hort. Kew. 57. *pl. 5.* 1769.

Stokesia cyanea L'Herit. Sert. Angl. 17. 1788.

Type locality: "Carolina."

Distribution: the coastal plain of the southeastern United States, from South Carolina to Louisiana.

13. ORTHOPAPPUS gen. nov.

Heads 4-flowered, aggregated into glomerules subtended by 1–2 bract-like leaves; involucre of eight scales arranged in decussate pairs, the two outer pairs much shorter than the inner, and the alternate pairs conduplicate; corolla as in *Elephantopus* L.; achenes 10-striate; pappus of about 30 uniform bristles, very slightly enlarged at the base. Herbaceous; principal leaves basal, the cauline reduced or bract-like; inflorescence spicate or the lower glomerules peduncled.

Type, *Elephantopus angustifolius* Sw.

The generic name refers to the straight uniform bristles of the pappus, a feature which distinguishes it from the nearly related genera *Elephantopus* and *Pseudelephantopus*.

Orthopappus is the only genus of the group *Elephantopeae* in which the pappus consists of numerous simple bristles. In the other genera they are limited in number, and more or less modified into scales at the base, or twisted and contorted towards the apex, or disposed in two evident series. So far as known the genus includes but one species, *O. angustifolius*, which however is very variable and may include several distinct forms.

The first recognition of the generic rank of the species was by Lessing, who included it, under the synonym *E. quadriflora*, in his new genus *Elephantosis*. The first species described in that genus was *Elephantosis biflora*, which must remain as the type, and to which the name still applies. *Elephantosis biflora* Lessing has a biseriate pappus, the scales of the outer series short and persistent, those of the inner long, flat, slightly twisted, and deciduous. The achenes of both species were figured by Lessing, and show the distinguishing characters well. In the same paper Lessing also described *Elephantopus angustifolius* Sw. The description agrees throughout with that of *Elephantosis quadriflora*, and his error was certainly due to the immature achenes of his specimens of *E. angustifolia*. De Candolle followed Lessing in the use of the genus *Elephantosis* and included in it Swartz's *Elephantopus angustifolius* without recognizing its identity with *Elephantosis quadriflora*. Schultz, in Linnaea **20**: 517 (1847), left *Elephantopus angustifolius* in *Elephantosis*, which he regarded as a section of *Elephantopus*, and created the new section *Elephantopsis* for Lessing's *Elephantosis biflora*. In the last treatment of the genus C. F. Baker (Trans. Acad. Sci. St. Louis **12**: 43. 1902) also includes *Elephantopus angustifolius* under *Elephantosis*, and is obviously in error when he states (page 45) that it is the type of the genus.

As a matter of fact the name *Elephantosis* belongs to *E. biflora*, and *Elephantopsis* is merely a synonym. Accordingly *Elephantopus angustifolius* of Swartz, here considered generically distinct, is left without a generic name, for which *Orthopappus* is now proposed.

Orthopappus angustifolius (Sw.) nom. nov.

Elephantopus angustifolius Sw. Prodr. Veg. Ind. Occ. 115. 1788.

Elephantopus nudiflorus Willd. Sp. Pl. 3: 2390. 1804.

Elephantosis quadriflora Lessing, Linnaea **4**: 323. 1829.
Elephantosis angustifolius DC. Prodr. **5**: 87. 1836.

Type locality: Jamaica.

Distribution: from Cuba and Mexico south through the West Indies and Central America to Paraguay and Bolivia.

14. ELEPHANTOPUS L. Sp. Pl. 814. 1753

Heads 1–5-flowered, aggregated into glomerules of one to several heads subtended by 1–3 foliaceous bracts; involucre of four decussate pairs of scales, the outer two shorter, the alternate pairs conduplicate; receptacle flat or nearly so; corolla-tube slender, the limb unequally 5-cleft with a much deeper fissure on the inner side; achenes truncate, ribbed; pappus of about 5 bristles dilated at the base. Herbs with leafy or scapiform stems, alternate or basal leaves, and corymbed pedunculate glomerules.

Type, *Elephantopus scaber* L.

About 14 species of tropical and subtropical distribution, rarely extending into the temperate zone, and mostly confined to the western hemisphere.

Bracts prolonged at the apex into a ligulate tip. 1. *E. pratensis.*
Bracts acute to acuminate, not prolonged into a tip.
  Pappus-bristles abruptly dilated into deltoid or broadly triangular bases.
    Stems leafy.
      Leaves oblong-elliptic to ovate, exceeding 2 cm. in width. 2. *E. mollis.*
      Leaves narrowly oblong-oblanceolate, about 1 cm. wide. 3. *E. dilatatus.*
    Stems nearly scapose. 4. *E. nudatus.*
  Pappus-bristles gradually dilated into narrowly triangular bases.
    Stems leafy. 5. *E. carolinianus*
    Stems essentially leafless, or with a few reduced leaves subtending the branches.
      Scales densely villous with long hairs. 6. *E. elatus.*
      Scales not densely villous.
        Leaves softly pubescent below, pubescent or glabrate above. 7. *E. tomentosus.*
        Leaves scabrellate above. 8. *E. scaber.*

1. ELEPHANTOPUS PRATENSIS Wright; Sauvalle, Anal. Acad. Ci. Habana **6**: 177. 1869.

Stem branching from the base, erect or ascending, 1–4 dm. high, hirsute-pubescent, especially below, or becoming glabrate above; leaves narrowly oblanceolate, entire, obtuse, acuminate at the base, glabrous or pubescent; glomerules mostly solitary on long peduncles;

bracts 2–3, cordate-orbicular with a prominent ligulate tip 5–10 mm. long.

Type locality and distribution: Cuba.

2. Elephantopus mollis H.B.K. Nov. Gen. 4: 26. 1818

Type locality: "crescit in provinciis Cumanae et Caracas."

Distribution: from Cuba and Lower California south into South America.

3. **Elephantopus dilatatus** sp. nov.

Stem erect, 3 dm. high, hirsute with brown hairs, densely so below, bearing several leaves separated by short internodes near the base and others scattered above; leaves thick, narrowly oblong-oblanceolate, 6–10 cm. long, 9–12 mm. wide, acute or subacute, remotely serrulate with low erect teeth, long-attenuate below, sparsely pilose with stiff appressed hairs on both sides, but especially on the veins beneath; inflorescence freely branching, bearing numerous glomerules on long sparsely pilose peduncles; bracts 3, broadly ovate, acuminate, prominently reticulated, pilose, equaling or shorter than the heads; involucre 7 mm. high; scales abruptly acuminate into a cuspidate tip, nearly glabrous below, glandular and sparsely pilose with short hairs toward the tip; achenes 2 mm. long, furrowed, minutely pubescent; pappus exceeding the achene, its bristles very abruptly dilated below into depressed broadly triangular bases.

Type: *Pittier 3733*, bords du Rio Ceibo, Buenos Aires, Costa Rica; in the Gray Herbarium. In the shape, size and pubescence of the leaves it resembles very closely the Brazilian *E. riparius* Gardn. but differs in the larger broader bracts and the short broadly dilated bases of the pappus-bristles.

4. Elephantopus nudatus A. Gray, Proc. Am. Acad. 15: 47. 1879

Type locality: Oxford, Delaware.

Distribution: from Delaware and Maryland south to Florida and west to Louisiana and Arkansas, mostly near the coast.

5. Elephantopus carolinianus Willd. Sp. Pl. 3: 2390. 1804

Elephantopus violaceus Sch.-Bip. Linnaea 20: 517. 1847.

Type locality: "habitat in Carolina, Florida, Jamaica."

Distribution: from New Jersey west to Illinois and Kansas, south to Florida and Texas, and apparently in Mexico and the West Indies.

6. Elephantopus elatus Bert. Misc. Bot. **11**: 21. 1851

Stems erect, rather sparingly branched, 5–10 dm. tall, leafless or with 1 or 2 cauline leaves, hirsute-pubescent, becoming densely tomentose above; basal leaves spatulate, oblanceolate or oblong, 1.5–2.5 dm. long, 3–6 cm. wide, obtuse, crenate, densely pubescent below; glomerules 1–1.5 cm. high, about equaled by the broadly ovate or triangular, short-acuminate, densely gray-pubescent bracts; scales densely villous with erect white hairs.

Distribution: South Carolina to Florida, thence west to Alabama and southern Arkansas.

7. Elephantopus tomentosus L. Sp. Pl. 814. 1753

Elephantopus nudicaulis Poir. Encyc. Suppl. **2**: 543. 1811.
Elephantopus nudicaulis Ell. Sk. **2**: 481. 1823.
Elephantopus carolinianus simplex Nutt. Gen. **2**: 187. 1818.

Type locality: "habitat in Virginia."

Distribution: from North Carolina, southeastern Kentucky and Tennessee, south to the Gulf and west to eastern Texas.

8. Elephantopus scaber L. Sp. Pl. 814. 1753

Stem erect, 2–4 dm. high, branching from the base, hirsute-pubescent; leaves oblong to obovate, crenate, acute or obtuse, narrowed at the base into margined petioles, more or less tomentose beneath, scabrous or scabrellate above; glomerules 1–1.5 cm. high; bracts broadly ovate, acute, hirsute and reticulate beneath; scales long-acuminate; achenes 3–4 mm. long, glabrous on the ribs, hirsute in the furrows.

Type locality: "habitat in Indiis."

Distribution: tropics of the Old World; sparingly introduced into the West Indies, Central America and South America.

The last two species are very closely related, and are scarcely distinguishable except by the broader, softer leaves of the former and the geographical distribution. By Schultz and some other botanists, they have been combined.

Doubtful Species

Elephantopus litoralis, *E. glaber*, *E. colimensis* Sessé & Moc. Fl. Mex. 216 (1896), are probably all synonyms of *Pseudelephantopus spicatus* (Juss.) Rohr.

15. PSEUDELEPHANTOPUS Rohr, Skrivt. Nat. Selsk. Kiob. 2 : 213. 1792

Distreptus Cass. Bull. Soc. Philom. 1817 : 66. 1817. — Dict. Sci. Nat. 13 : 366. 1819.

Heads 4-flowered, aggregated into sessile glomerules of 1–5 heads subtended by usually two bract-like leaves; involucre of four pairs of decussate scales, the first and third pairs conduplicate, the outer two pairs shorter than the inner; corolla as in *Elephantopus;* achenes 10-striate, flattened; pappus of 5–15 bristles, the two lateral ones longer and thicker than the intermediate ones and plicate or contorted at the tip. Stems leafy, freely branching; leaves dilated and clasping at the base; inflorescence terminal, of panicled spikes.

Type, *Elephantopus spicatus* Juss.

The genus is well characterized by the sessile glomerules of few heads and the dissimilar pappus-bristles bent or twisted near the tip. Besides the single North American species, which is very variable and may cover several distinct forms, the Bolivian *Spirochaeta Funckii* Turcz. may also be included in the genus.

PSEUDELEPHANTOPUS SPICATUS (Juss.) Rohr, Skrivt. Nat. Selsk. Kiob. 2 : 213. 1792

Elephantopus spicatus Juss.; Aubl. Pl. Gui. 2 : 808. 1775.
Distreptus spicatus Cass. Dict. Sci. Nat. 13 : 367. 1819.

Type locality : " la Guiane françoise."

Distribution : from Cuba and central Mexico south into South America.

16. ROLANDRA Rottb. Coll. Soc. Med. Havn. 2 : 256. 1775

Heads 1-flowered, subtended each by a chaffy bract and aggregated into dense axillary glomerules; involucre of two scales, the outer larger and enclosing the inner; corolla 4-lobed; style 2-cleft, the lobes scarcely separate; pappus a short irregularly toothed crown. Stem herbaceous, leafy; leaves alternate, white-tomentose beneath.

A monotypic genus of tropical America.

ROLANDRA FRUTICOSA (L.) Kuntze, Rev. Gen. Pl. 1 : 360. 1891

Echinops fruticosa L. Sp. Pl. 815. 1753.
Rolandra argentea Rottb. Coll. Soc. Med. Havn. 2 : 258. 1775.

Stems erect, sparingly branched, 2–8 dm. high, finely puberulent; leaves oblong to elliptic, 3–10 cm. long, acute or short-acuminate, entire or undulate, narrowed below into short pubescent petioles,

scabrellate above, tomentose beneath; glomerules numerous, dense, 1–1.5 cm. in diameter; involucre 4–5 mm. high, the outer scale slightly exceeding the inner and each tipped with a straight or bent spine; achene glabrous, 2 mm. long; pappus 0.5–1 mm. long, of numerous unequal fimbriate segments.

Type locality: "habitat in America meridionali."

Distribution: from Porto Rico south through the West Indies to Brazil.

17. SPIRACANTHA H.B.K. Nov. Gen. 4: 28. 1818

Heads 1-flowered, aggregated into glomerules of 12–20 heads, each subtended by a coriaceous spinous bract; inflorescence capitate, of several glomerules, subtended by 3 or 4 foliaceous bracts; involucre of 5 or 6 scales in two series; corolla 4- or 5-lobed; style 2-lobed, with short branches; achene slightly compressed, obscurely 5-nerved; pappus of numerous stout erect unequal scales. Stem suffruticose, branching, bearing the spiny capitate glomerules on axillary or terminal peduncles.

A monotypic genus of tropical America.

Spiracantha cornifolia H.B.K. Nov. Gen. 4: 29. 1818

Stem low, loosely branched, pubescent, 2–4 dm. high; leaves petioled, ovate, acute, entire, sparsely pubescent above, pale and thinly tomentose beneath; peduncles pubescent, the subtending leaves thin, ovate; glomerules ovoid; bracts oblong, hirsute above, broadly rounded at the apex and bearing a squarrose spine one-third to one-half the length of the bract; heads 3–4 mm. high; scales linear, thin, glabrous, sharply acuminate, 1-nerved, 3 mm. long, beset at the base with hairs of the same length; achene obovoid, glabrous, 2 mm. long.

Type locality: "crescit in umbrosis humidis ad portum Sapote prope Rio Sinu."

Distribution: from Yucatan south to Colombia.